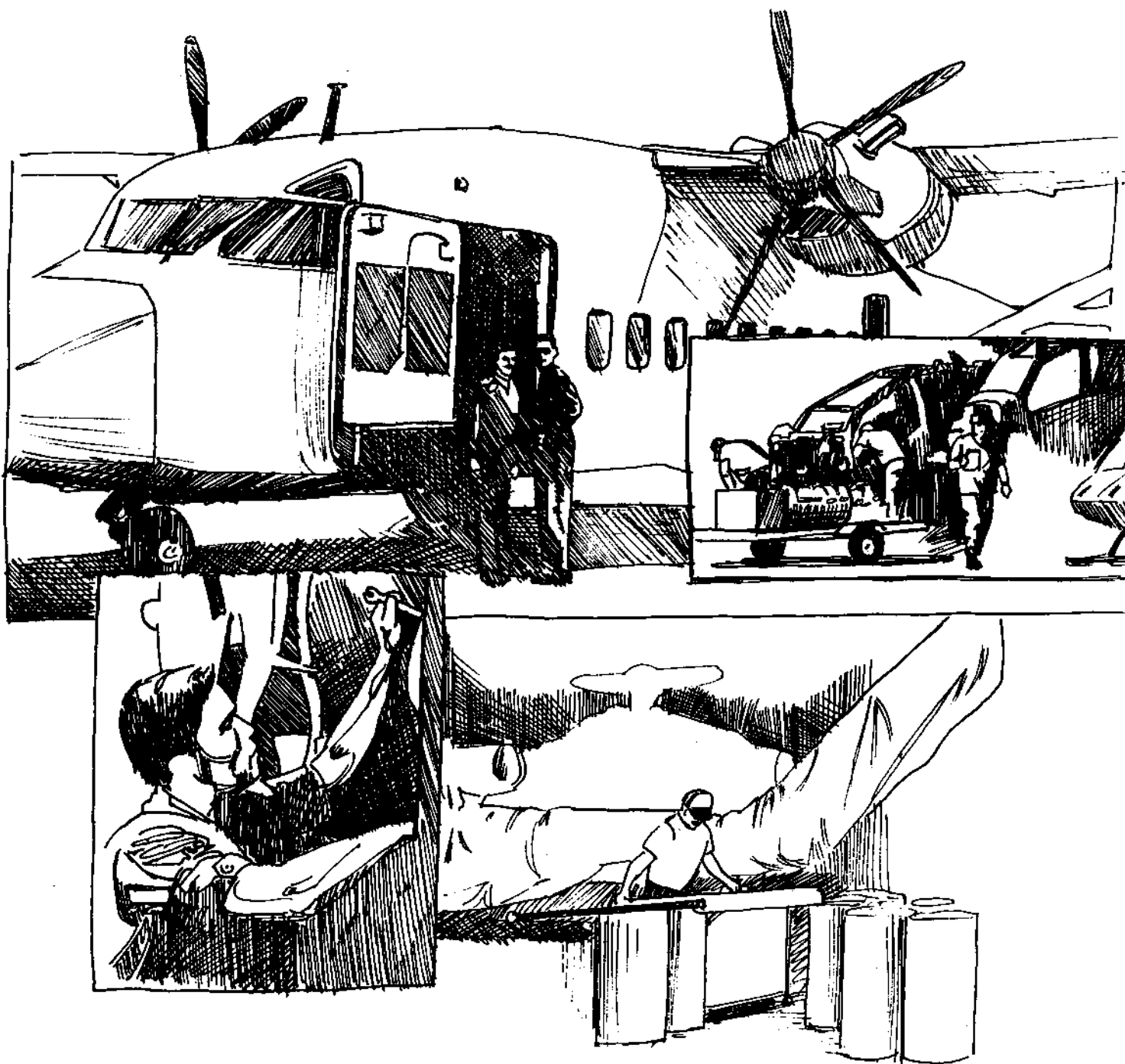


Desert Shield And Desert Storm, An Aviation Logistics History: 1990 - 1991



Howard K. Butler
COMMAND HISTORIAN

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUN 1991		2. REPORT TYPE		3. DATES COVERED -	
4. TITLE AND SUBTITLE Desert Shield and Desert Storm, An Aviation Logistics History: 1990-1991				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Army Aviation System Command, St Louis, MO, 63101				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 283	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

DESERT SHIELD AND DESERT STORM,
AN AVIATION LOGISTICS HISTORY:
1990-1991

BY
HOWARD K. BUTLER
COMMAND HISTORIAN
UNITED STATES ARMY AVIATION SYSTEMS COMMAND
SAINT LOUIS, MISSOURI
JUNE 1991

Foreword

As was the wont of the New Historians of the '20s, this volume shall begin with a warning to the reader. The pages which ensue are not, as the professional historian would prefer, the work of a completely detached observer writing at least a half-century after the events of which he relates took place. They are, instead, the product of a contemporary who, if he did not have first-hand experience in the theatre of operations, did attend the daily crisis conferences and did gather his materials fresh from the heart of the headquarters' war effort, the Emergency Operations Center. He listened to, took notes about and from, and interviewed, Aviation Systems Command personnel, and he heeded the frequent and lengthy discourses of his commander on sundry pertinent matters, both great and small.

Two conclusions may be drawn from the preceding. One, the product of the author's endeavours might often be personal in character, and, two, the composition might have a strong bias in favour of the Aviation Systems Command. Both deductions have warrant. The author, therefore, entreats the reader to consider these failings merely as foibles, to smile, and to gain, hopefully, some insight of, and knowledge about, the doings of the Aviation Systems Command in those desert events of 1990 and 1991.

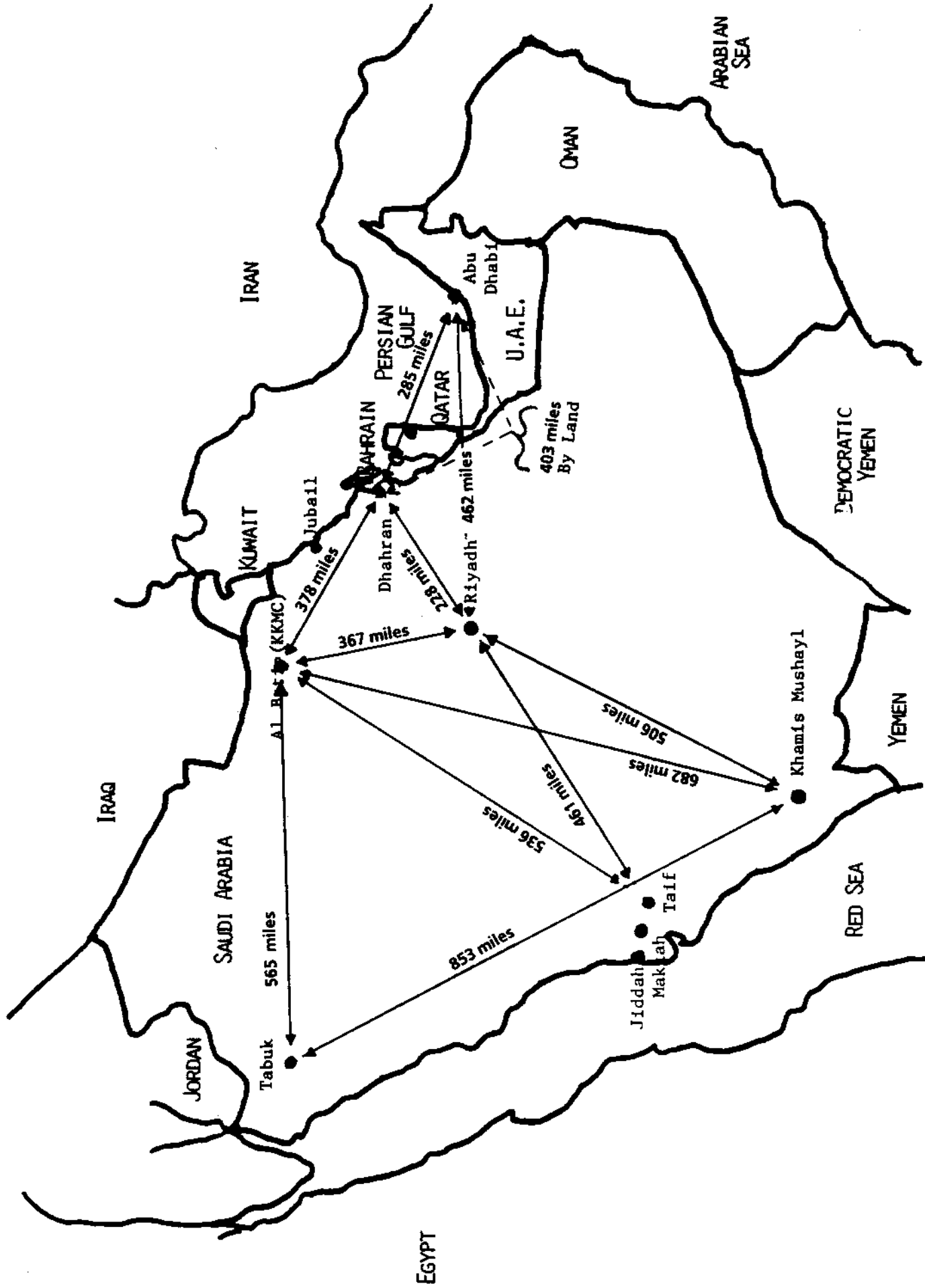
The author wants to thank two people who were instrumental in the composition of this book. One was Lieutenant Colonel Thomas R. Prickett, the Officer-in-Charge of the day shift of the Aviation Systems Command's Emergency Operations Center. Too much praise can not be said of this officer's contributions. He was an unfailing font of information; there was no acronym that he - and often he alone- could not decipher, no organizational structure

that he could not adumbrate, no topic which he could not address with aplomb and sagacity, and no map or other material which he could not unfailingly supply. Further, he responded to all of these pesky queries with an alacrity and a cheerfulness which belied the unbelievable stress and tedium which accompanied his assignment. When the historian ran into a road-block, Lieutenant Colonel Prickett blew it aside. The other help-mate was Mrs. Anna Yvonne Beahon. While officially but a Desert Shield temporary employee, Mrs. Beahon put to shame the energy, diligence, and organization of all but the most dedicated. Unfailingly pleasant, Mrs. Beahon threaded her way past the author's penmanship, arranged all of the tables and charts, and edited the entire manuscript.

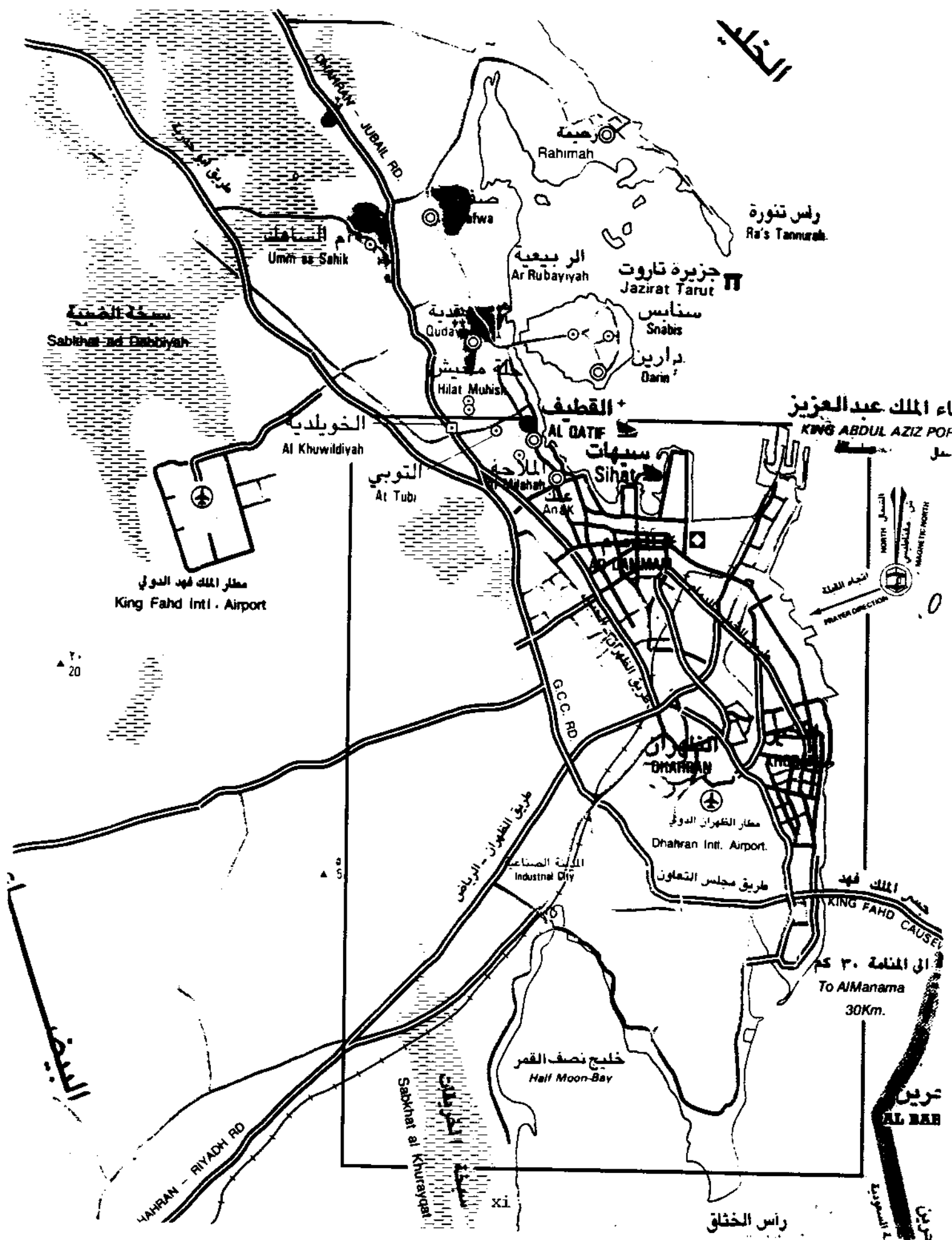
Errors of omission, of fact, of interpretation, or of anything else, are the fault of the author.

Done at Saint Louis, Missouri, this Saturday, the eighth day of June, in the Year of Our Lord Nineteen and Ninety-One.


HOWARD K. BUTLER



الخليج



رأس تنورة
Ra's Tannurah

جزيرة تاروت
Jazirat Tarut

سنابس
Snabis

دارين
Darin

الربيعية
Ar Rubayyah

قنطرة
Qudayr

حيلات موش
Hilat Mushi

القطف
Al Qatif

سيهات
Sihat

أنك
Anak

التوبي
At Tubi

الخويلدي
Al Khuwildiyah

مطار الملك فهد الدولي
King Fahd Intl. Airport

الملك عبدالعزيز
KING ABDUL AZIZ PORT

البحر
Sea

الشمال
NORTH
مغناطيسي
MAGNETIC NORTH
اتجاه القبلة
PRAYER DIRECTION

الظهران
DHAHRAN

مطار الظهران الدولي
Dhahran Intl. Airport

طريق مجلس التعاون
Cooperation Council Road

المدينة الصناعية
Industrial City

طريق الطوارق - الرياض
Tawarikh - Riyadh Road

جسر الملك فهد
KING FAHD CAUSEWAY

إلى المنامة ٣٠ كم
To Al Manama
30Km.

خليج نصف القمر
Half Moon Bay

سبخة الخويطر
Sabkhat al Khaytari

الرياض - الدمام
RIYADH - DAMMAM

رأس الخفاق

البحر
AL BAH

السعودية
Saudi Arabia

CONTENTS

	<u>PAGE</u>
Introduction	1
General.....	1
Army Aviation.....	1
Aviation Logistical Concerns.....	2
Organization	6
Initial Purpose.....	6
Concepts of Operation - AVSCOM.....	6
Concepts of Operation - DA.....	13
Concepts of Operation - AMC.....	17
Deployments in the Desert	19
Aircraft.....	19
Troops.....	20
The Enemy.....	22
Aircraft Logistical Support: An Initial Assessment	25
Obstacles.....	25
Survivability.....	26
Countermeasures.....	29
Preventive Maintenance.....	34
Aircraft Logistical Support: The Segments	36
General.....	36
Air-Line-of-Communications (ALOC).....	37
The Personal Connexion: The Establishment.....	43
The Personal Connexion: The Contractors.....	45
The Personal Connexion: The AVSCOM Reduction-in-Force.....	52
The Personal Connexion: Saudi Arabia and the National Guard...	53
Parts.....	53
Items: AIMI.....	54
Items: Classifications.....	55
Items: Particulars.....	56
Summary.....	58
The AMC and Aviation Desert Operations	61
Background.....	61
Addressment.....	64
AVSCOM Substance.....	71
TAMP-FORWARD.....	71
TAMP-BASE.....	72
TAMP-KKMC.....	75
The AVSCOM in SWA - A Review on Charts.....	76
Southwest Asian Operations: 2 August 1990 - 30 September 1990.	84
Introduction.....	84
The AVSCOM - Action and Reaction.....	87
The AVSCOM - An Early Team Review.....	91
The AVSCOM - An Assessment.....	92

Southwest Asia Operations: 1 October 1990 - 15 November 1990	96
The Parts Game.....	96
Preemption.....	100
Sand.....	105
Counter-Sand.....	107
Flying Hours.....	107
Trainers.....	112
Readiness: To and Fro - 1 October 1990 to 4 March 1991	112
Review.....	112
Rates.....	113
Rate Inhibitors.....	115
Recognition.....	118
Revisitation.....	120
General.....	120
Technical.....	121
Engines and Filters.....	121
Blades.....	124
Windshields.....	126
Bearings.....	127
Covers.....	128
ASE.....	129
Global Positioning System (GPS).....	133
Other Items.....	136
Materiel.....	138
General.....	138
TMDE.....	139
GSE.....	139
MWO Equipment and Tools.....	140
Defense to Offense: Enter the VII Corps	144
Background.....	144
The VII Corps Arrives.....	151
Transportation.....	158
Competition.....	163
AVSCOM Measures.....	165
Preliminary.....	165
Float.....	165
Retrograde/RX/DX.....	168
Desert Express/Camel Express.....	170
Improvement of Maintenance Facilities.....	175
Lift Capability.....	181
MEDEVAC.....	181
The Commander's Touch.....	182
The General Irby Road Show.....	182
Three Stars.....	184

Desert Storm: The Seven-Week War - 16 January - 27 February 1991	192
Perspective.....	192
The Obstacles.....	201
Flying Hours.....	201
Transportation.....	204
Requisitions.....	205
Programmes.....	206
Maintenance.....	209
The Ideal and the Real.....	209
TAMP-SA: Mission and Structure.....	209
General.....	209
Engine Repairs.....	212
Assessment.....	214
NOSL.....	216
Review.....	217
Supply.....	221
Retrograde.....	221
Flow.....	224
Routine.....	224
Extraordinary.....	225
The Float in February.....	227
Review and Assessment.....	228
One Hundred Hours: The Mother-of-All-Battles	230
Action?.....	230
Losses.....	236
Aircraft Survivability Equipment (ASE).....	238
AVSCOM In-Theater Manpower.....	240
Aircraft Readiness.....	242
A TACOM Comparison.....	246
Equipment Assessment.....	247
The Accounting.....	249
Introduction.....	249
Supply.....	250
Transportation.....	250
Maintenance.....	250
Fielded Aviation Systems.....	252
Engineering.....	253
Weapon System.....	254
ASE.....	254
CH-47.....	255
UH-60.....	255
AH-64.....	255
OH-58D.....	256
Avionics.....	256
ALSE.....	257

The Aftermath: March and April of 1991	257
Exordium.....	257
Disengagement.....	262
Operation Provide Comfort.....	265
The Rest of the World.....	268
Other Issues.....	269
Incarceration of the Past.....	269
The Legacy.....	270

Introduction

General

The Iraqi invasion of Kuwait on August the 2nd, 1990, and the resultant decision by the President to deploy land, air, and naval forces to protect Saudi Arabia and the United Arab Emirates led, since August the 8th, 1990, to a steady, measured commitment of soldiers, sailors, airmen and supporting equipment to Southwest Asia. That commitment, which began approaching its apparent apex by early November, suddenly broadened on the 8th of that month when the President expanded the original defensive objective to entail the liberation of Kuwait. His policy addendum called for doubling the 200,000 men in Southwest Asia to about 400,000, and he gave Iraq a January the 15th, 1991, deadline to quit Kuwait or face massive military force.

Overall American policy in this matter could, therefore, be considered roughly three-phased: one, the original defensive deployment of 200,000 strong, August 8 - November 8, 1990; two, the reinforcement to attack strength of about 400,000, November 8, 1990, to January 15, 1991; and three, January 16, 1991, to February 27, 1991 - war.

Army Aviation

The observation of Major General (MG) York almost two decades ago still applied: "Helicopters? How did the Army ever fight a war without them?" The original four Army divisions and supporting elements in Saudi Arabia would, when fully deployed, have just over 900 airplanes, nearly all of them helicopters. The subsequent augmentation decision called for about 1,600 and later 1,922 airplanes. Each one of these machines was highly complex,

ultra-sophisticated, quite often fragile, and, most importantly, ever-changing, constantly incorporating not only practical improvements, but also the latest technological advances. Hence the 1968 model Hueys in Saudi Arabia were, except for superficial appearances, completely different devices than the airships accepted at Hurst so long ago.

As the foregoing suggests, Army aircraft required a large amount of money, an elaborate maintenance support structure, dedicated production facilities, a reliable transportation system, and a well-trained work force just to maintain a readiness status quo. Therefore, when combat units began to deploy to a faraway region with virtually no logistical support of any kind on hand, the AVSOM had to supply such support as soon as possible. This entailed four major steps which, in order of immediacy, were:

- the establishment of an aviation logistical support structure in Southwest Asia to control and coordinate the supplies and replacements for, and the maintenance of, Army and other aircraft;
- the connexion of that structure with extant aviation support elements, said elements chiefly being in the Continental United States and said connexion being almost exclusively aerial;
- the solution of the critical problems of Army aviation in Southwest Asia;
- and the development of uniform procedures for aviation logistics support in Southwest Asia.

Aviation Logistical Concerns

Army aviation was not logistically ready for a long, big war. There were two reasons for this. One, long-term, were those defense budgets which had

long since ceased to keep pace with the relentless inflation that gripped America. The other, more immediate, was the post-cold war, April, 1990, decision to cut the active Army from 18 divisions to 10 and the reserves from 10 to 5, all by 1995. The AVSCOM, for its part, was to see the air arm which it supported drop from 9,000 to 7,000.

This air arm was difficult to maintain, old, and, in many cases, obsolescent. For the layman to understand the upkeep of such a fleet, a common example might be in order. Suppose our layman purchased, 25 years ago, an automobile for \$250,000, or about twelve-and-a-half times the present average new car cost. When he drove it off the showroom floor, two factory mechanics would be in the back seat, each carrying a tool box. When he arrived home, he would park the car in a garage filled with parts and computer repair equipment. Each week, the car would return to the dealer for a complete change of its hoses, belts, tires, battery, generator, and so forth, and each month the car would receive a new engine, transmission, and computer. In addition to these preventive maintenance procedures, the owner's home would get daily air drops of parts, manuals, and so forth from Detroit. The result of all these steps would be a car that would be considered successful if it failed to start no more than one day out of four. Of course, the car would also be able to cruise at 125 miles per hour, be bullet-proof, carry machine guns and guided rockets, and be irreplaceable; a new car now would cost our owner \$22,000,000.

The air fleet, unfortunately, was much as that of our car owner. The backbone of that armada was still the Huey, nearly 3,000 strong, whose development had begun in 1955. Even the so called "new" additions to the

fleet, the UH-60 Black Hawk and the AH-64 Apache, were old-timers; development of the former had begun in 1971 and the latter in 1972. Late in the 1970s, after the Vietnam war had ended, the Army had tried to secure nine new models, or three each - heavy, medium, and light - in the lift, scout, and attack categories. The Congress made short work of this, and so the Army had to convert older models into better versions, the prime examples being the OH-58D Scout and the CH-47D medium lift helicopters. There was one catch-all development program underway to replace the entire light fleet - the AH-1s, the UH-1s, the OH-6s, and the OH-58s - called the Light Helicopter Program, but even this effort, dated from 1983, was no more than a state-of-the-art air vehicle, and it had undergone severe vicissitudes since then - from 7,000 in size to 4,500 to 2,000 to 1,200 and perhaps to extinction. The upshot was even more revisions in the Huey's last year of life, which currently extended to 2025.

The AVSCOM had two tasks to do for its dinosaurs - one, to keep them afoot, and two, to keep them up to date. A lack of money severely impacted both chores. It was not uncommon, for example, for a helicopter to sit for months awaiting a part, and the modification backlog meant, for another instance, that nearly the whole Black Hawk fleet that initially deployed to Southwest Asia did not have proper anti-air missile protection. Moreover, the AVSCOM could not raid war reserves or prepositioned stocks to right these faults; they too, were unfunded.

The Army had, historically, fought other wars with far less preparations than it had for this one. There was, however, one major difference this time; the money spigot did not open wide. Make-do was the result; thus, even though

the services deployed about the same number of men to Saudi Arabia as they had to Vietnam a quarter-century earlier, the AVSCOM had to struggle to support a helicopter force that was less than one-half as strong - 1,800 to 4,200 as in the preceding conflict, and the later one, moreover, had severe flying hour restrictions.

The outlook was thus, arguably, grim. Nevertheless, the AVSCOM was able, through a combination of the diversion of a great deal of its personnel to the addressment of the Southwest Asian affair and the employment of somewhat daring funding procedures, to maintain the deployed fleet constantly above the DA standard. The negative side of this attention was a parts and maintenance starvation of those Army airplanes not in the zone of operation. Mercifully, it would be, for the Army, only a 100-hour, almost bloodless, war; even with the measures cited, some aircraft models, such as the Apache, could only have fought for about 15 days at the worst-case projection of flying hours and losses.

The ensuing pages which trace the AVSCOM's desert endeavours must, therefore, take into account two agents which always lurked about. One was want; the logistical demands of the war would have to be met, in the main, by juggling what was at hand and improvising on a major scale. The other, almost a corollary of the first, was thorough: the AVSCOM determined that those Army airplanes in the zone of operations would suffer not; their most critical requests would be answered, their urgent modifications would be performed, and their parts warehouse would be filled. With these characters in mind, we shall turn to the AVSCOM's preliminary preparations for war.

Organization

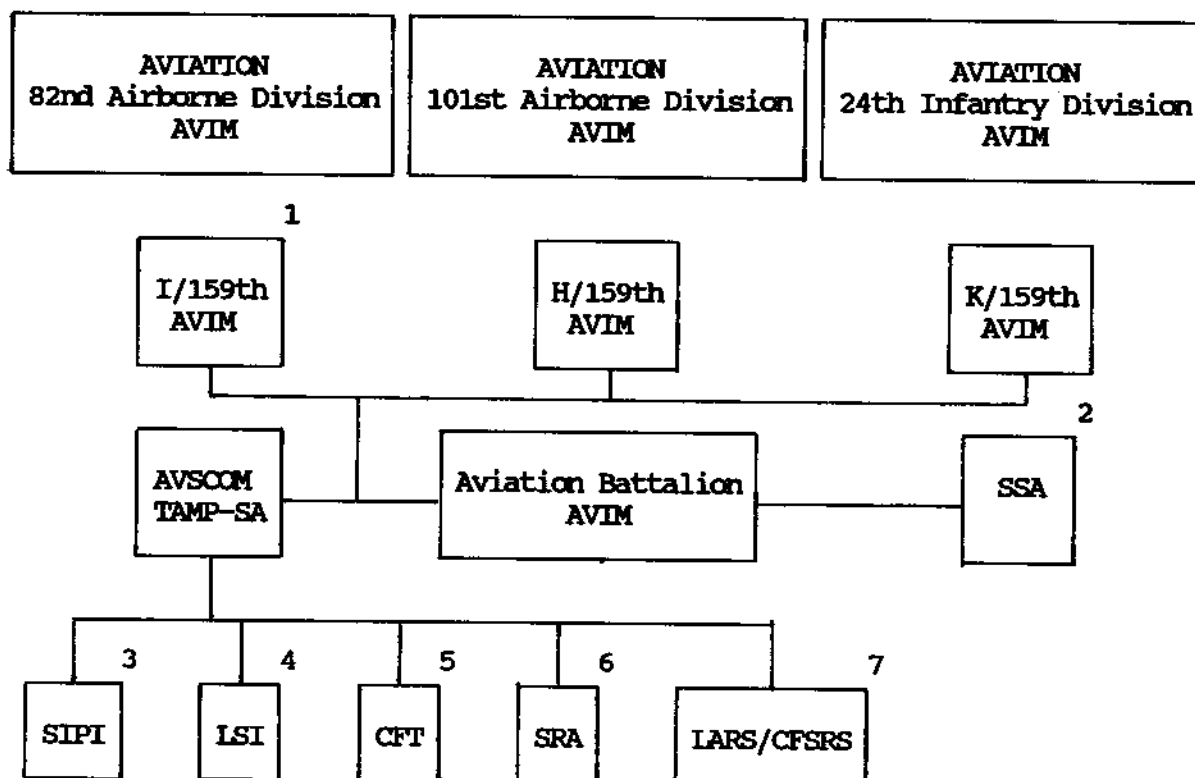
Initial Purpose

Due to the deployment of combat elements without the bulk of their concomitant stateside logistical appendices, the AVSCOM decided that it must establish a nexus of its representatives within the potential zone of operations posthaste. The focus of these AVSCOM agents was the Theater Aviation Maintenance Program - Saudi Arabia (TAMP-SA). Attached to the 1st Combat Support Command (COSCOM), and under the operational control of that command's Aviation Maintenance Battalion, the TAMP-SA would come to consist of two elements - TAMP-SA Forward, located in Dhahran, Saudi Arabia, just inland from the Persian Gulf, and about 250 miles down the coast from the extreme south-eastern border of Kuwait, and TAMP-SA Base, sited at Abu Dhabi International Airport. The airport lay approximately 300 air miles east southeast of Dhahran; it rested on the mainland, just east of the island of Abu Dhabi and connected to it by a causeway. In elemental terms, the TAMP-SA Forward's primary concerns were to be the rapid repair and return of aviation equipment and the application of modifications, while the TAMP-SA was to perform overhauls and act as an aviation depot.

Concepts of Operation - AVSCOM

The AVSCOM decided, in short, to anticipate a sure surge of demands for maintenance services, and the TAMP-SA's objective was to coordinate these claims. Since the AVSCOM could not predict requirements, it adopted a flexible approach that placed a majority of skilled personnel forward, under the operational control of the non-divisional and divisional Aviation Intermediate Maintenance (AVIM) battalions of the first three divisions ashore. Behind

these men, the TAMP-SA would act as the orchestrator of their various capabilities. An illustration of the AVSCOM's thinking was:



¹For example, I Company of the 159th Maintenance Battalion

²Supply Support Activity

³Sikorsky International Products, Incorporated

⁴Lear Siegler International

⁵Contractor Field Teams

⁶Special Repair Activity

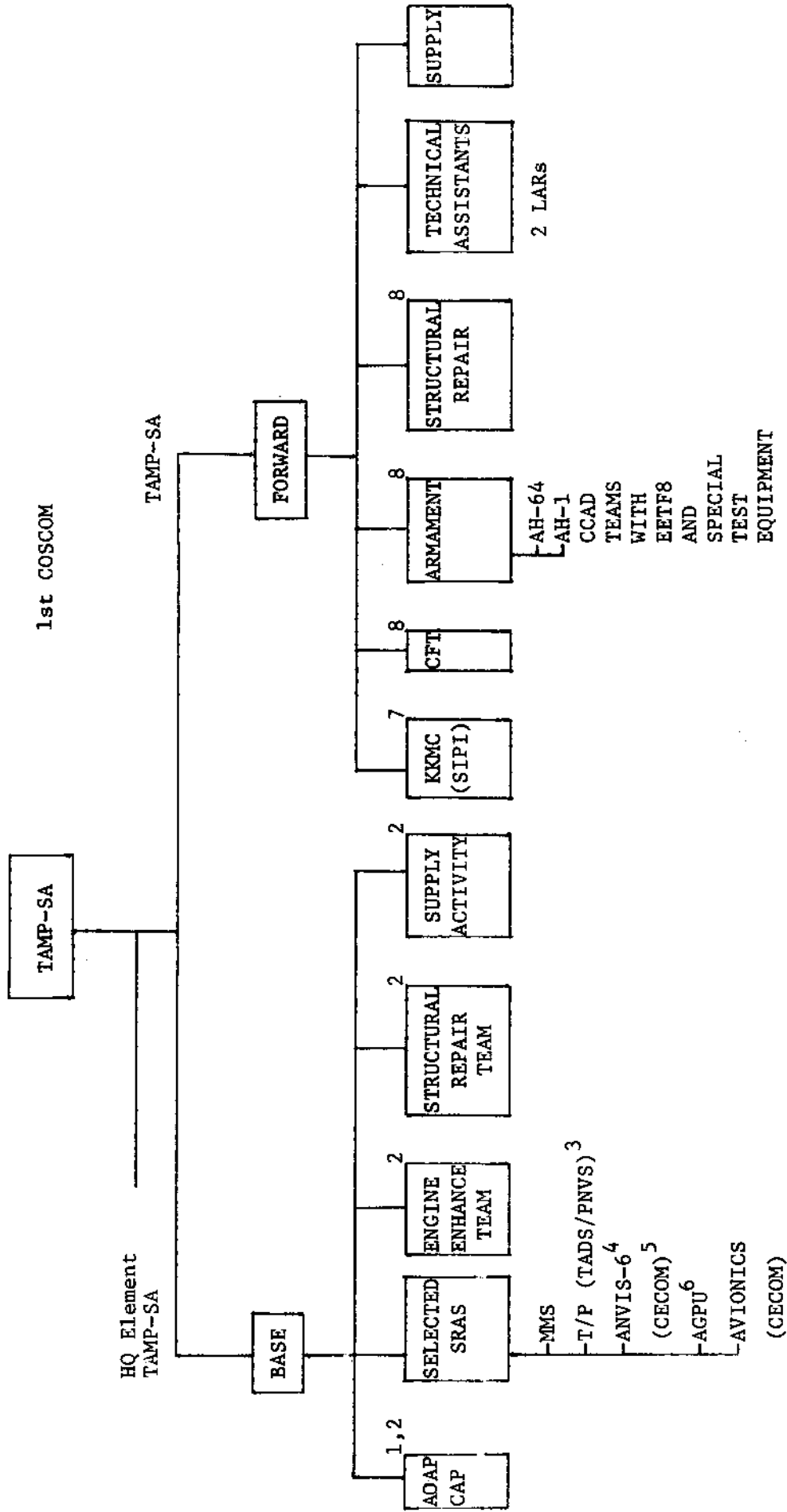
⁷Logistics Assistance Representatives (Government Employees) and Contractor Field Service Representatives

The AVSCOM noted that there were two prominent weaknesses in its proposed organization. It did not possess a maintenance infrastructure, such as the SIPI and the LSI had furnished in Panama, and it was especially short of electronics maintenance for the Target Acquisition Designation System/Pilot Night Vision Sensor (TADS/PNVS) and the Advanced Helicopter Improvement Program's (AHIP's)¹ Mast Mounted Sight (MMS).²

The organizational notion quickly assumed a series of growing dimensions. Five days after the appearance of that first concept, far more detailed breakdowns of both TAMP-SA

¹The AHIP was an OH-58D helicopter, improved over the OH-58A, B and C models.

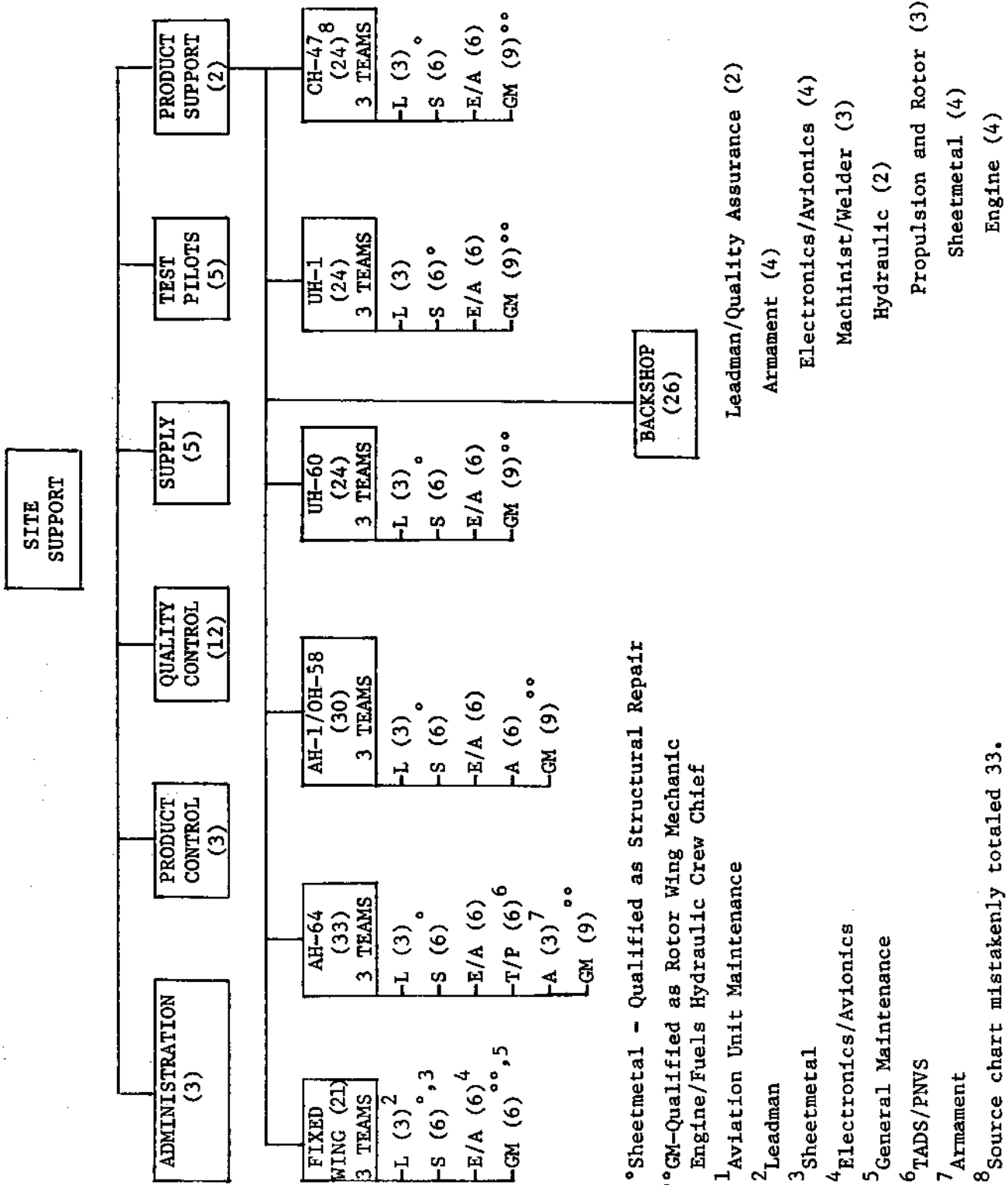
²Memorandum for Mr. Joseph P. Cribbins, Special Assistant to the Deputy Chief of Staff for Logistics, DALO-AV, from Mr. Daniel J. Rubery, Logistics Director, Headquarters, AVSCOM, 14 August 1990, subject: Aviation Support for Operation Desert Shield - A Notional Concept.



- 1 Army Oil Analysis Program
- 2 Capability
- 3 Target Acquisition Designation System/Pilot Night Vision Sensor
- 4 Aviation Night Vision Imaging System
- 5 Communications-Electronics Command, an AVSCOM Sister Command
- 6 Auxiliary Ground Power Unit
- 7 King Khalid Military City, Saudi Arabia
- 8 Electronics Equipment Test Facility

CFT AVUM¹/AVIM SUPPORT

and on-site unit support came forward



This more detailed charting included the following features:

- a TAMP-SA
- a management structure collocated with the COSCOM's, possibly at Riyadh
- a dedicated Air-Line-of-Communications (ALOC) - 2 CH-47s, 1 UH-60, and 2 C-23s
- a functional structure, with a focus on customer support
 - KMC (SIPI) in-country contract
 - CFT - collocated support, non-divisional AVIM company (breakout provided)
 - Armament - Corpus Christi Army Depot (CCAD) Teams
 - Structured repairs, pass back (returns to rear)
 - Technical Assistance - LARs, CFSRs, Engineers - focus on retaining components in service
 - Supply - focal point for RX/DX (Reparable Exchange/Direct Exchange) SRA components
- Base
 - focus on wholesale support
 - location recommended at Abu Dhabi or, alternatively, Jeddah or Taif
 - Army Oil Analysis Program (AOAP) - emergency aviation capability
 - SRA - consolidation of critical asset repair capabilities
 - Engine Enhancement Team - Fort Campbell with Modular Engine Test Stand (MEETS). Limited depot and evaluation.

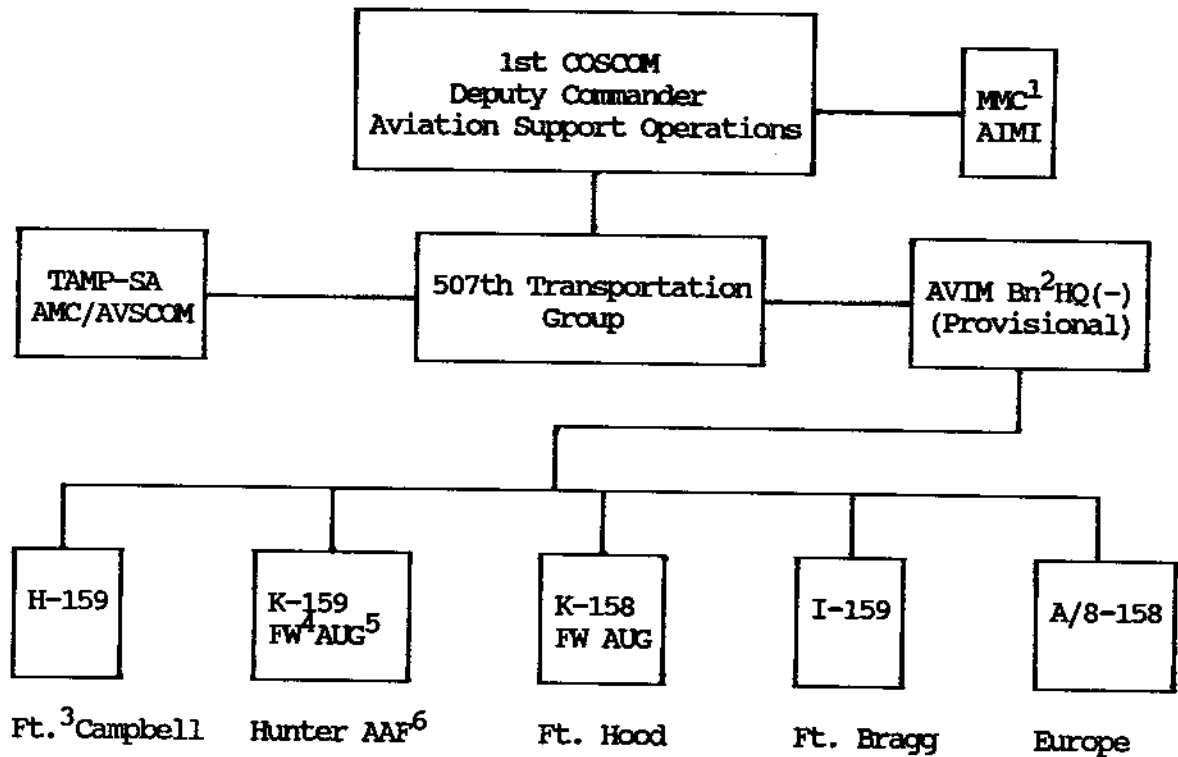
- Structured Repair Team. Pass back airframe and blade repair
- Supply activity - line to TAMP-SA Forward Supply
- Rough order of magnitude - HQs Element (10)
 - Base (60)
 - Forward (300)
 - 370¹

¹Figures do not include administrative or logistical support.³

³Data Facsimile Transmission (FAX), Mr. Ronald Powell, AVSCOM, Directorate for Maintenance (AMCOC-RE), to HQ, AMC (AMCOC-RG), General Arwood, 19 August 1990, subject: (Operation Desert Shield (ODS))

Concepts of Operation - DA

One must emphasize that the preceding charts were, after all, proposals, not final outlines. Further charts would continue to appear, most notably that of the Office of the Deputy Chief of Staff for Logistics (ODCSLOG), Special Assistant for Aviation, on 27 August 1990:



¹ Materiel Management Center

² Battalion

³ Fort

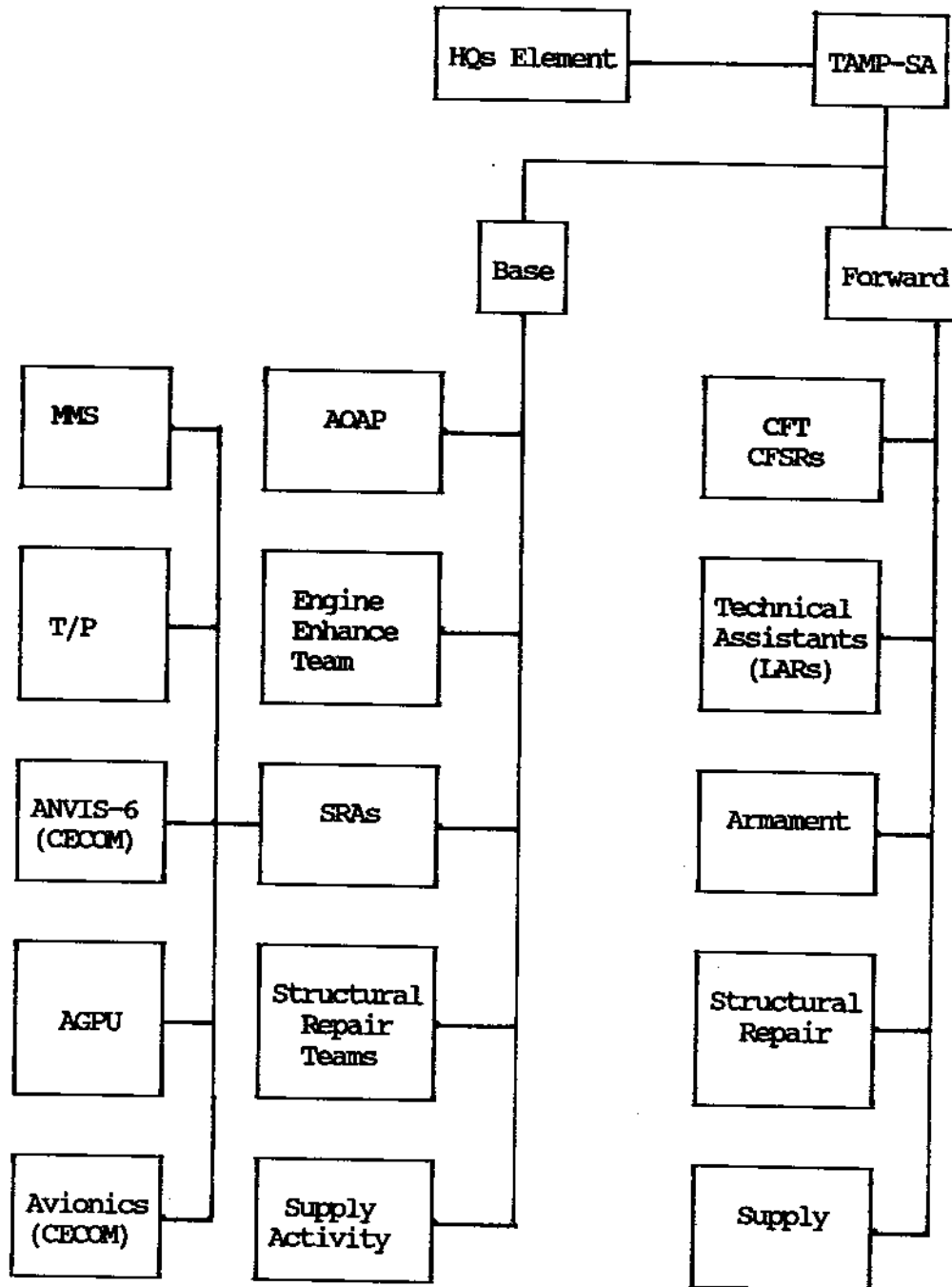
⁴ Forward

⁵ Augmentation

⁶ Army Air Field

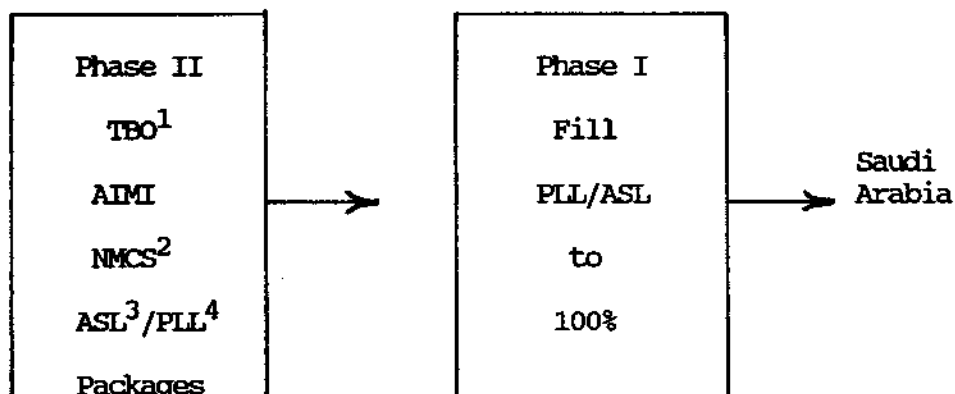
The ODCSLOG's amendments included the establishment of a Deputy Commander for Aviation Support Operations in the COSCOM, the attachment of the TAMP-SA to the 507th Transportation Group, the creation of an AVIM Battalion Headquarters for command and control, and the use of the MMC to receive, store, and issue AIMI and to provide support to non-divisional AVIMs.

The ODCSLOG also discussed a dedicated support air-line-of-communications (ALOC), both inter- and intra-theater, the formulation of procedures to ensure in-transit asset visibility and priority, the use of commercial air, the facile transit of customs roadblocks, and it presented a simplified TAMP-SA arrangement:



Execution of the ODCSLOG concept would rely heavily upon contract support, particularly that already in Southwest Asia on Foreign Military Sales (FMS) work. Hence, the Army would seek to modify "host nation" support FMS contracts in order to obtain the services both of the American civilians and of their facilities as foundations for expansion. Some of the more important "in-country" contractor holdings included a Pan Am hangar at Abu Dhabi large enough to accommodate three of the giant 737 commercial airliners at once; the presence of large numbers of LSI and SIPI personnel, some at work on Air Force agreements; and the AVSCOM's own Project Manager (PM) Saudi Arabia organization which was monitoring the Saudi acquisition of UH-60 Desert Hawk and Bell 406 Scout Helicopters. In addition to these, the Saudis themselves had some potentially useful assets, such as the 650 square mile King Fahd International Airport just north and west of Dhahran.

With whatever was at hand, the ODCSLOG envisioned an initial two-phased "push package" direct support (DS) supply concept:



¹Table(s) of Basic Organization

²Not Mission Capable Supply

³Authorized Stockage List

⁴Prescribed Load List

Immediate complementary maintenance to these supplies would be largely the province of the following companies, whose contracts covered these specific systems:

- AH-64A - McDonnell-Douglas Helicopters, Martin-Marietta, and General Electric
- AHIP - Bell Helicopter and McDonnell Douglas Electronics
- UH-60 - Sikorsky and General Electric
- CH-47 - Boeing and Lycoming

The TAMP-SA was to set up a component repair capability in-theater and the AVSCOM was to buy clamshell shelters to do maintenance work under cover and to effect

- the retention of skilled soldiers on the flight line;
- the establishment of a Weapon Systems Manager (WSM) for Army Aviation;
- the intensive management of critical serviceable and unserviceable aviation components;
- and the already discussed issues of transportation control, in-transit asset visibility, and customs barriers.⁴

Concepts of Operation - AMC

The Army Materiel Command (AMC), the AVSCOM's parent and technically its intermediary with the DA, had little to do with all of this aviation logistics planning and sometimes showed startling mis-information about events. On 21 August 1990, for example, it informed the ODCSLOG that

⁴Fax, the DALO-AV, to the AVSCOM, 27 August 1990, subject: Aviation Logistics Structure Concept - Direct Support.

"B. Concept has been finalized (sic) for in-country Aviation Maintenance Support. Concept calls for a forward element located in Riyadh"⁵
. while that very forward point was a-building in Dhahran.

That the AMC would, and would remain, fundamentally out of aviation logistics affairs, had lengthy historical roots. On 8 November 1962, when the Army began providing aerial support to the Republic of Vietnam, the DA established Special Project Air Vietnam with Lieutenant Colonel Joseph P. Cribbins as its Project Officer. The AMC established a Special Project Officer at the Transportation Materiel Command⁶ in St. Louis with authorization to communicate directly with LTC Cribbins. The Cribbins - St. Louis pairing enabled the DA to solve both current and future problems, working so well that it remained in place throughout the Vietnam War - and far beyond. In August 1990, almost 28 years later, LTC - now Mr. Cribbins - was still in the same post, and so was his special association with the AVSCOM.⁷

⁵Message (MSG), AMCOC-RE, to DALO-LOC, 21 August 1990, subject: AMC SITREP No. 0006. Writer's Notes: 1) The AMCOC-RE was the HQs, AMC's Emergency Operations Center (EOC) and the DALO-AOC was the ODCSLOG's counterpart. 2) SITREP is short for Situation Report.

⁶An earlier name for the organization now known as the AVSCOM.

⁷As background see: Howard K. Butler, Army Aviation Logistics and Vietnam, 1961-1975, St. Louis, 1985, pp. 32-33.

Deployments in the Desert

Aircraft

Before the outlines of a logistical structure for Southwest Asia had taken any form, aircraft were already entering the potential zone of combat. On 12 August 1990, just 8 days after the President's decision, 38 Army aircraft came ashore in Saudi Arabia:

<u>Aircraft Type</u>	<u>Number</u>
AH-1E	12
OH-58A/C	11
OH-58D	5
UH-60	8
UH-1H	<u>2</u>
Total	38 ⁸

A week later, 66 aircraft were in Saudi Arabia:

<u>Aircraft Type</u>	<u>Number</u>
AH-64A	33 ¹ (18) ²
UH-60A/L	18 (3)
OH-58A/C	11 (7)
OH-58D	<u>4</u>
Total	66

¹Figures outside of parentheses are those of the 82nd Airborne and 101st Air Assault Divisions combined.

²Those in parentheses represent the 101st's aircraft alone.⁹

⁸MSG, AMCOC-RE, to AMSAV-L-EOC, et alia, 12 August 1990, subject: (Operation Desert Shield (ODS)); after 16 January 1991, ODS meant Operation Desert Storm. Writer's Note: The AMSAV-L-EOC was the AVSCOM's Emergency Operations Center.

⁹MSG, DALO-AV, to AMSAV-L-EOC, 19 August 1990, subject: Aircraft Status (as of 19 August 1990).

Five days later, the numbers reached 119¹⁰ against a goal of 1,040, divided, as follows, by aircraft types:

<u>Aircraft Type</u>	<u>Number</u>
AH-64	205
AH-1	83
UH-60	248
UH-1	113
OH-58D	24
OH-58A/C	238
CH-47D	83
Other	<u>46</u>
Total	1,040 ¹

¹Mistakenly shown in the original as 959.¹¹

By the end of August, 201 aircraft were in theater.¹²

Troops

The troops whom these airplanes supported also arrived very rapidly. By the 11th of September, 1990, the Army had, in the theater, the following strengths:

¹⁰MSG, DALO-AV, to the AMSAV-L-EOC, 24 August 1990, subject: Summary Aircraft Status (as of: 24 August 1990).

¹¹MSG, DALO-AV, to AMSAV-L-EOC, 25 August 1990, subject: Operation Desert Shield Force Structure.

¹²MSG, DALO-AV, to the AMSAV-L-EOC, 1 September 1990, subject: Summary Aircraft Status (as of 13 August 1990).

<u>Element</u>	<u>Numbers</u>
COMUSARCENT ¹	307
SUPCOM(PROV) ²	1,619
HQs, XVIII Airborne Corps	6,271
82nd Airborne Division	12,074
24th Infantry Division (Mechanized)	16,781
101st Airborne Division (Air Assault)	7,388
11th ADA ³ BDE ⁴	706
11th SIG ⁵ BDE	88
513th MI ⁶ BDE	<u>203</u>
Total	43,465

¹Commander, United States Army Central (Command); COM arbitrarily left out of acronym.

²Provisional

³Air Defense Artillery

⁴Brigade

⁵Signal

⁶Military Intelligence¹³

Five days later, Army strength reached 51,923.¹⁴

¹³MSG, AMOC-RE, to the Chairman, Joint Chiefs of Staff (CJCS), 11 September 1990, subject: (ODS).

¹⁴2,525 of whom were women. Total American strength was 166,023. See MSG, AMCRE-AV, to the AVSCOM-L-EOC, 16 September 1990, (same subject).

The Enemy

Not since the Japanese had the Army faced such a pitiless, fanatical, and, seemingly then, formidable foe. Death would be a sweet choice indeed for any American rather than to fall alive into Iraqi hands; one's lot would then surely be excruciating torture punctuated by grotesque, obscene maiming. There were, moreover, a multitude of these maimers. An initial report indicated that Iraq had seven divisions in Kuwait - four heavy, two light, and one special forces composite.¹⁵ By the end of August, 24 divisions were in Kuwait or in adjacent areas of southern Iraq. Estimates of the number of these troops, and their equipments, were:

<u>Area</u>	<u>Men</u>	<u>Tanks</u>	<u>APCs</u> ¹	<u>Artillery Pieces</u>
Kuwait	147,000	1,200	800	650
Southern Iraq	<u>117,500</u>	<u>815</u>	<u>645</u>	<u>270</u>
Totals	264,500	2,015	1,445	920

¹Armored Personnel Carriers¹⁶

¹⁵AVSCOM Foreign Intelligence Office (FIO), Iraq-Kuwait: Situation Update, 9 August 1990.

¹⁶FIO Situation Report (SITREP) 25: Iraq/Kuwait, 31 August 1990.

The Iraqis had a variety of modern armaments when they invaded Kuwait. Examples were French Mirage F-1 and F-2000 and Russian M-29 fighters;¹⁷ Russian T-54, T-55, T-62, T-72 and PT-76 tanks;¹⁸ Russian anti-aircraft weapons such as the ZSU-23-4 and the SA-2, -3, -6, -7, -9, -13, -14, and -16 surface-to-air missiles (SAMs), as well as the French Roland;¹⁹ infrared countermeasure (IROCM) and laser rangefinder antipersonnel devices;²⁰ several Soviet tactical communications intercept systems;²¹ millions of mines of many types;²² stocks of lethal nerve and blister gasses and a proven propensity to use them;²³ and a long-range Russian missile, the SCUD which, in variants,²⁴ would come to gain infamy in attacks upon civilian targets.²⁵ Complementing this inherent arsenal were a sizable number of items

¹⁷FIO Situation Report (SITREP) 5: Iraq/Kuwait, 8 August 1990.

¹⁸FIO Situation Report (SITREP) 12: Iraq/Kuwait, 18 August 1990.

¹⁹FIO Situation Report (SITREP) 8: Iraq/Kuwait, 13 August 1990.

²⁰FIO Situation Report (SITREP) 9: Iraq/Kuwait, 14 August 1990.

²¹FIO Situation Report (SITREP) 10: Iraq/Kuwait, 15 August 1990. Writer's Note: SITREPs for both 14 and 15 August carry the number 9.

²²FIO Situation Report (SITREP) 11: Iraq/Kuwait, 17 August 1990.

²³FIO Situation Report (SITREP) 4: Iraq/Kuwait, 7 August 1990.

²⁴FIO Situation Report (SITREP) 7: 9 August 1990.

²⁵Writer's Note: Much of the SCUD's indiscrimination was due to the "guess-work" in aiming it.

captured from the Kuwaitis, the most significant of which were about 100 French Exocets, of Falkland Islands dishonor, with six Exocet fast attack TWC-45PTG missile delivery boats,²⁶ four Improved-Hawk (I-Hawk) launchers together with their missiles,²⁷ and about 250 British tanks of three types.²⁸

As many a dictator with a big army, Hussein could not resist the urge to use it. At first, Iraq offered the fantasy that its only purpose in Kuwait was to replace the emir with a "popular" government.²⁹ Within days, however, Iraq announced "full unity" between Kuwait and Iraq,³⁰ and it seemed evident that, as Iraq began stationing forces on the Saudi border, Kuwait was just a whistle-stop on the road to Mecca.³¹ By August the 12th, apparent Iraqi preparations for such an attack were nearly complete.³²

In sum, the United States faced an able, armed, and aggressive opponent - and it faced him well-nigh alone.

²⁶1) FIO Situation Report (SITREP) 2: Iraq/Kuwait, 6 August 1990. 2) SITREP 9, report cited.

²⁷SITREP 5, report cited.

²⁸SITREPs 12-18, reports cited.

²⁹FIO Situation Report (SITREP) (no number), Iraq/Kuwait, 6 August 1990.

³⁰FIO, Deputy Chief of Staff for Intelligence, DA, Iraq/Kuwait: Situation Report (no number), 9 August 1990.

³¹1) FIO Situation Report (SITREP) 3, 7 August 1990. 2) FIO, Deputy Chief of Staff for Intelligence, DA, Iraq-Kuwait: Situation Update, 10 August 1990.

³²FIO, Deputy Chief of Staff for Intelligence, DA, Iraq-Kuwait: Situation Update, 12 August 1990.

Aircraft Logistical Support: An Initial Assessment

Obstacles

In consideration of its own desert experience and that of the Saudis, discussed earlier, it is unsurprising that the AVSCOM was, as early as 14 August 1990, able to enunciate the chief obstacles of Southwest Asia operations vis-a-vis airplanes:

"A) Operations in (a) desert environment cause erosion and shorten component life.

"B) Temperature extremes will adversely affect aircraft mission capability (life in high temperatures).

"C) Support and preventive maintenance procedures have an increased impact in this environment.

"D) Constant attention to cleaning and repainting appropriate areas will reduce loss due to wear.

"E) Visibility/pilot disorientations (are) due to desert operations."

The AVSCOM, in addition, not only began to single out

". aircraft (which have) environmentally sensitive components:

AH-1	Engine
	Main Rotor and Tail
	Blades
AH-64	Main Rotor and Tail
	Blades
	Main Rotor Head"

but it also noted that the most serious ". . . . needs (were) engine particle separators and blade guards."³³

On 18 August 1990, the AVSCOM concluded both that ". . . . deterioration problems (can) result from high day (sic) temperatures, ultraviolet radiation, sand and dust, and large daily temperature fluctuations (and that) aircraft can be protected from these deterioration problems by using protective covers and maintaining inspections." The command then listed, as supplements to operation and maintenance manuals, two warnings about personal handling of equipment or fuels at high temperatures, eleven inspection and maintenance procedures, and eleven preventive maintenance measures.³⁴

Survivability

Although the AVSCOM had not yet realized the havoc which the fine grit of Saudi Arabia would wreak, the barriers which it did surface - the heat and "the environment" - would constitute two of the three major logistical concerns for the balance of the desert operation. The third, and, in combat, certainly the most significant of all, were those items which collectively bore the tag Aircraft Survivability Equipment. These included:

- one, the AN/APR-39(V)1 Pulse Radar Warning. The -39 warned against acquisition by the SA-2, SA-3, SA-6, SA-8, and Roland missiles and the ZSU-23-4 gun battery.

³³MSG, AMSAV-I-EOC, to the AMCOC-RE, 14 August 1990, subject: (ODS)

³⁴MSG, Mr. William S. McDonald, Chief Maintenance Engineering Division, Directorate for Maintenance, Headquarters, AVSCOM, to the Commander (CDR), Joint Command Southeast (JCSE), MacDill Air Force Base (AFB), Florida, 18 August 1990, subject: Impact on Personnel and Equipment Operations in a Dust/Sand Environment.

- two, the AN/APR-44(V)3 Continuous Wave Radar Warning. The -44(V)3 warned against such semi-active missiles as the SA-6, Hawk, Improved-Hawk (I-Hawk), AA-7 and AA-10.
- three, the AN/ALQ-144A Infrared (IR) Jammer. The -144A jammed such guided missiles as the SA-7, SA-9, SA-14, SA-16, Redeye and Basic Stinger.
- four, the AN/APR-136(V)1 (Quiet Camp). The -136(V)1 jammed the ZSU-23, 256, and SA-8.
- five, the M-130 Chaff Dispenser. This M-130, when dispensed at the appropriate time, and when coupled with the appropriate aircraft manoeuvre, decoyed those threat tracking radars which the -136(V)1 had not jammed. Such threats were the SA-2, SA-3, SA-4, SA-5, SA-6, SA-8, ZSU-23-4, Roland, Fox Fire, and High Lark.
- six, the M-130 Flare Dispenser. The M206 Flares of this dispenser also, when dispensed at the appropriate time with the appropriate manoeuvre, decoyed the SA-7, SA-9, SA-14, SA-16, Redeye, and the AA-2B/D, AA-3D/F, AA-6B, AA-7A and AA-8A air-to-air missile threats.
- seven, the AN/ALQ-147A(V). With the Louvered Scarfed Shroud IR Suppressor (LSSS) on the OV-1D, the -147A(V) jammed, rearwards, the SA-7, SA-9, SA-14, Redeye, Basic Stinger, AA-2B/D, AA-3D/F, AA-6B, and AA-8A/B/C. The -147A(V) also jammed well the SA-13 at night.
- eight, the AN/ALQ-144(V)1. When combined with the Hover IR Suppressor Subsystem (HIRSS) on the UH-60, and with nap-of-the-earth (NOE) and night operations, the -144(V)1 jammed the SA-7, SA-9, and Redeye.
- nine, the AN/APR-39(V)2 Pulse Radar Warning. The -39(V)2 warned against the SA-2, SA-3, SA-6, SA-8 and ZSU-23-4.

- ten, the AN/APR-162(V)2 Continuous Wave Radar Jammer. The -162(V)2 jammed semi-active guided missiles such as the SA-6, Hawk, I-Hawk, AA-7 and AA-10.

- eleven, the AN/ALQ-156(V)2 Missile Approach Detector. Used with the M-130 Flare Dispenser, the -156(V)2 countermeasured the SA-7, SA-9, SA-13, SA-14, SA-16, Redeye, Basic Stinger, AA-2B/D, AA-3D/F, AA-6B, AA-7A, and AA-8A.

The above eleven systems would, in conjunction with the ISS and the HIRSS, provide either protection against, or an alarm for, virtually every missile in the Iraqi inventory, as well as the ZSU-23-4 guns. None of the six aircraft discussed, however, had all eleven:

<u>Aircraft</u>	<u>Systems</u>
Armed OH-58D (Prime Chance)	1, 2, 3
AH-1F Cobra	1, 3, 4, 5
AH-64 Apache	1, 3, 4, 5
UH-60 Black Hawk	1, 5, 6
EH-60 Quick Fix	5, 7, 8, 9, 10
OV-1D Mohawk	2, 3, 5, 7, 10, 11
RU-21 Guadrail	1, 2, 5, 10

The most vulnerable of all aircraft was the UH-60 Black Hawk, which rapidly became the workhorse of and most numerous of, Army aircraft. The UH-60, in general, was vulnerable to the SA-13, SA-14, SA-16 and Basic Stinger. Some of

the UH-60s, moreover, did not have HIRSSs, which made them ". . . . extremely vulnerable to IR missiles of all types and should not be utilized in threat areas if at all possible." (Underlined in message.)³⁵

Countermeasures

The AVSCOM almost immediately took several preventive measures in anticipation of Saudi desert-peculiar conditions. The first of these were, in order:

- Chemical Agent Resistant Coating (CARC). The AVSCOM described the type of desert camouflage color paint desired, or an acceptable substitute, and general guidance for its application.³⁶

- Mooring aircraft in the desert. Due to a lack of paved surfaces for aircraft in Southwest Asia, the AVSCOM began to scout about for mooring items, particularly a 4-inch anchor and three 8-inch anchors. The command's installation instructions specified that there were two acceptable substitutes and that the units might abandon the anchors when they moved.³⁷

³⁵1) MSG, Colonel (COL) Thomas E. Reinkober, Project Manager (PM), Aircraft Survivability Equipment (ASE), to the CDR, 101st Airborne (ABN) Division (Div), Air Assault (AASLT), Fort Campbell, Kentucky, et alia, 14 August 1990, subject: Survivability Features of Desert Shield Aircraft. 2) MSG, COL Thomas E. Reinkober, PM, ASE, to the CDR, 504 Military Intelligence (MI) Brigade (BDE), Fort Hood, Texas, 8 September 1990, same subject.

³⁶1) MSG, DALO-ZA, Department of the Army (DA) (DA commonly means Headquarters (HQ), DA), to the COMUSARCENT, Fort McPherson, Georgia, 17 August 1990, subject: Chemical Agent Resistant Coating (CARC) Painting for Operation Desert Shield. 2) COL Thomas E. Reinkober, PM, ASE, to the 20th Theater Army Materiel Management Center (TAMMC), Zweibrucken, Germany, 22 August 1990, subject: Painting of Aircraft for Desert Shield.

³⁷1) MSG, COL Ramon A. Ivey, Director of Readiness, HQ, AVSCOM, to the Coast Guard (COGARD) Air Station, Miami, Florida, 22 August 1990, subject: Mooring of all Army Aircraft on Paved and Nonpaved (sic) Surfaces. 2) MSG, COL Ramon A. Ivey, Director of Readiness, 3 October 1990, same subject.

- Rotor blade erosion. By mid-September 1990, the AVSCOM had completed the development of two erosion preventives for rotor blades. One was Task L-100 Polyurethane Paint and the other 3M 8663 Polyurethane Tape for leading edges and an Agevat 1301 Brush-on Polyurethane Coating for tip caps, if applicable. The paint was an interim measure because of its ready availability; the tape had a life span twice as long; its recent development and proven use was an off-spring of the UH-60 derivation, the S-70 Desert Hawk of the Royal Saudi Arabian Land Forces.³⁸ The tape would be an issue for months to come.

- The M-43 Protective Mask. Due to the not too farfetched possibility that the Iraqis might use germs or chemicals on allied troops, the AVSCOM began buying the M-43 Series Protective Mask for all aviation units. The M-43 provided a shield against chemical and biological attacks. For those air crew members who wore spectacles, the command provided, per two years of AH-64 experience, a two-man team which could outfit eight crew members per month with corrective contact lenses.³⁹

³⁸1) MSG, COL Ramon A. Ivey, Director of Readiness, to the Commander in Chief, Southern Operations Command (USCINCSOC), MacDill AFB, Florida, et alia, 22 August 1990, subject: Rotor Blade Erosion Protection in Support of Operation Desert Shield. 2) MSG, COL Ramon A. Ivey, Director of Readiness, to the USCINCSOC, et alia, 15 September 1990, same subject.

³⁹MSG, LTC James C. Reynolds, Product Manager (PM - the same acronym for Project Manager), Aviation Life Support Equipment (ALSE), for the COMUSARCENT Maintenance, 2 September 1990, subject: Fitting Army Aircrews with Contact Lenses.

- Laser Eye Protection. In consideration of the Iraqi possession of a vast number of light amplification by the simulated emission of radiation (laser) rangefinders and their history of use of them, the AVSCOM addressed a variety of protection equipment for Apache and Cobra air crews using the Apache's Target Acquisition Designation System (TADS) Direct View Optics, the Cobra's Telescopic Sight Unit, and either laser spectacles or visors. The safeguard devices included, for the AH-64, a contingency filter for the TADS and 350 2-notch - 1.064 micron and 0.694 micron setting - Individual Helmet and Display Sight System (IHADSS) Visors; and, for the Cobra, work began to outfit those AH-1s which had deployed without the M65 and M65/Laser Augmented Airborne Tracker (LAAT) Telescopic Sight Unit (TSU). In addition, the PM, ALSE, purchased 3,000 each 2-notch and 3-notch H6U-56/P Spectacles and 700 each 2-notch and 3-notch IHADSS compatible spectacles to be delivered by 14 September 1990, the former being for night use and the latter for the day, and the Product Manager for Clothing and Individual Equipment (PM-CIE) provided 9,000 each 2-notch and 3-notch visors in December of 1990.

The above aggregations countered any known Iraqi threat.⁴⁰

- Terrain or obstacle avoidance. Although no specific device emerged for such avoidance, all Army aircraft had the AN/APU-209 Radar Altimeter System to provide the pilot with a low altitude warning light alert. The system

⁴⁰1) MSG, Project Manager, TADS/Pilot Night Vision Sensor (PNVS), to the CDR, 101st Airborne Division, Air Assault (ABN DIV, AASLT), et alia, 7 September 1990, subject: Laser Eye Protection for Apache and Cobra Crews. 2) MSG, Program Executive Officer (PEO) Aviation (AV), to the PM, TADS/PNVS, et alia, 6 September 1990, same subject.

measured straight downwards and, therefore, did not tell the pilot what might lay ahead.⁴¹

- Enhanced Navigation System. In order to improve navigation for Desert Shield aircraft, the Program Executive Officer (PEO) for Aviation (AVN) and the AVSCOM proposed the installation of the Trimble Trimpack Global Positioning System (GPS) on such aircraft. Since there were only 1,400 of these systems on hand for both ground and air, the AVSCOM needed priorities. As of 24 August 1990, the projected needs were 785 for 940 aircraft; the 16 UH-1Hs and 82 AH-1E/Fs needed one per two aircraft, the 159 UH-60A/Is one per three aircraft, and the rest, one per each aircraft. The AVSCOM and the PEO Aviation (AVN) funded the development of the "A" kit-wiring and mounts; the "B" kits were removable receivers.⁴²

- Personnel Locator System. The Personnel Locator System (PLS) consisted of two principal components - the Personnel Locator Radio Set AN/ARS-6(V) and the Survival Radio Set AN/PRC-112. The AN/ARS-6(V) enabled one to rescue an aviator equipped with the AN/PRC-112 radio and earlier survival radios such as the AN/PRC-90. Fifteen PLS mission kits were to be built to outfit 30 UH-60 Medical Evacuation (MEDEVAC) helicopters. There were already 500 AN/PRC-112s on order, with issue to be one per aircraft mission.⁴³

⁴¹MSG, AMSAV-L-EOC, to the CINCSOC, et alia, 3 October 1990, subject: Low Altitude Warning.

⁴²MSG, AVSCOM-L-EOC, to the COMUSARCENT MAIN, G-3 Aviation, 4 October 1990, subject: Quick Reaction GPS Installation in Support of Operation Desert Shield.

⁴³MSG, AVSCOM-L-EOC, to the COMUSARCENT MAIN, G-3 Aviation, 3 October 1990, subject: Personnel Locator System (PLS).

- Improved Drive System Lubricant. The Naval Air Propulsion Center qualified Department of Defense (DOD)-L-85734 Lubricant as a direct replacement for, and an improvement over, the current standard, Military (MIL)-L-23699 Lubricating Oil. DOD-L-85734 had an extreme pressure (EP) additive which provided a better wear protection and a higher load carrying capacity than the MIL-L-23699 lubricant.⁴⁴

- New Aerial Recovery Kits. Six new Interim Unit Maintenance Aerial Recovery Kits (I-UMARK) were to undergo shipment to aviation intermediate maintenance units on 21 September 1990. The kits, with instructions, were to enable a unit to recover OH-58A/C, UH-1, AH-1, UH-60, and AH-64 helicopters with rotor blades installed.⁴⁵

- and, lastly only in discussion order, "Clamshells," or portable maintenance hangars. The mid-sized one, 210 feet by (x) 76 feet x 28 feet when erect in place, could accommodate four AH-64s or four UH-60s and two CH-47s. The cost was \$142,000 apiece.⁴⁶ The clamshells could be shaped into various

⁴⁴MSG, AVSCOM-L-EOC, to the CINCSOC, et alia, 5 October 1990, subject: An Improved Lubricant, DOD-L-85734 for Helicopter Drive Systems to Support Desert Shield Aircraft.

⁴⁵MSG, COL Ramon A. Ivey, Director for Readiness, AVSCOM, to the CDR, XVIII AEN Corps Forward (FWD) and the COMUSARCENT SUPCOM (PROV), 19 September 1990, subject: New Aerial Recovery Kits.

⁴⁶MSG, AMSAV-L-EOC, to the AMCOCC-RE, 20 August 1990, subject: Operation Desert Shield.

forms up to 200 feet wide; constructed of a marine-grade aluminum alloy truss frame covered by ultra-violet resistant, all-weather elastomeric fabrics, they were fire and earthquake resistant, capable of withstanding the weight of heavy snows and the force of hurricane winds, and easily erected in poor weather by unskilled laborers.⁴⁷

Preventive Maintenance

Complementing the additional items were especial emphases on maintenance to preserve Army assets on hand. Significant among these were:

- Special in-flight checks for UH-1, AH-1, OH-58D, OH-58A/C, CH-47D, UH-60, and AH-64 aircraft operating in Saudi Arabia;⁴⁸

⁴⁷Clamshell Buildings, Incorporated, System 100 Clamshelters, Santa Barbara, California, (1990). Writer's Note: Each AVUM was to receive one clamshell and each AVIM two: Memo, LTC Michael A. Carothers, Aviation Logistics Officer, for Mr. Cribbins, Special Assistant to the ODCSLOG for Air, 3 September 1990, subject: Sand Impact on Readiness.

⁴⁸1) MSG, Mr. James A. Ray, Acting Director of Engineering, AVSCOM, to the CINCSOC, et alia, 23 October 1990, subject: Special In-Flight Hit Checks for UH-1, AH-1, OH-58, and OH-58A/C Aircraft Operating in Saudi Arabia. 2) MSG, Mr. James A. Ray, Acting Director of Engineering, AVSCOM, to the CINCSOC, et alia, 26 October 1990, subject: Special In-Flight Hit Checks for CH-47 Aircraft Operating in Saudi Arabia Theater. 3) MSG, Mr. James A. Ray, Acting Director of Engineering, to the CINCSOC, et alia, 29 October 1990, subject: Special In-Flight Hit Checks for UH-60 and AH-64 Aircraft Operating in Saudi Arabia Theater.

- The institution of minimum mandatory combat maintenance standards for helicopters either scheduled to be, or actually in, the combat zone;⁴⁹
- The provision of recommended maintenance, water wash and cool-down procedures for aircraft gas turbine engines;⁵⁰
- The description of special steps to mitigate the one-third life of batteries in very hot weather;⁵¹

⁴⁹1) MSG, Mr. William S. McDonald, Chief, Maintenance Engineering Division, Directorate for Maintenance, AVSCOM, to the CDR, JCSE, et alia, 18 August 1990, subject: Combat Phase Inspection for TM (Technical Manual) 55-1520-238-PM (Preventive Maintenance) (Phased Maintenance Checklists AH-64 Helicopters). 2) MSG, Mr. Daniel J. Rubery, Logistics Director, AVSCOM, to the DALO-AV, et alia, 19 November 1990, subject: Operation Desert Shield. 3) MSG, Mr. William S. McDonald, Chief, Maintenance Engineering Division, Directorate for Maintenance, to the CDR, JCSE, et alia, 22 August 1990, subject: Combat Phase Requirements for T55-1520-228PM (OH-58A/C Aircraft Phase Maintenance Checklist). 4) MSG, Mr. William S. McDonald, Chief, Maintenance Engineering Division, Directorate for Maintenance, to the CDR, JCSE, et alia, 22 August 1990, subject: Combat Phase Requirements for T55-1520-210-PM(UH-1 H/V and EH-1H/X Aircraft Phased (sic) Maintenance Checklist. 5) MSG, Mr. William S. McDonald, Chief, Maintenance Engineering Division, Directorate for Maintenance, to the CDR, JCSE, et alia, 24 August 1990, subject: Combat Phase Requirements for TM55-1520-240PM(CH-47D) Helicopter Phase Maintenance Checklist) (sic). 6) MSG, Mr. Thomas A. Geoffroy, Chief, Maintenance Engineering Project Management Branch, Directorate for Maintenance, AVSCOM, to the CDR, JCSE, et alia, 31 August 1990, same subject. 7) MSG, COL Gary D. Johnson, Director of Maintenance, AVSCOM, to the CDR, JCSE, 19 October 1990, subject: OV1/RV-1 (sic) Combat Phase Maintenance.

⁵⁰1) MSG, Mr. Ronald Powell, Deputy Director of Maintenance, AVSCOM, to the CDR, JCSE, et alia, 16 September 1990, subject: Recommended Maintenance Procedures for Operation of Aircraft Gas Turbine Engines in Desert/High Sand and Dust Environment. 2) MSG, COL Ramon A. Ivey, Director of Readiness, AVSCOM, to the CINCSOC, et alia, 5 October 1990, subject: Water Wash Procedures and Cool Down Periods for U.S. Army Aircraft Gas Turbine Engines.

⁵¹MSG, COL Ramon A. Ivey, Director of Readiness, AVSCOM, to the CINCSOC, et alia, 12 October 1990, subject: Vented Nickel Cadmium (NICAD) Aircraft Batteries in Desert Shield.

- The description of steps to undo sand damage to an aircraft's electrical circuit breakers;⁵²

- and the issuance of limited waivers, on a case-by-case basis, to allow the operation of aircraft which had undergone repairs and would not normally operate without lengthy procedures.⁵³

Aircraft Logistical Support: The Segments

General

At this juncture, the AVSCOM had, in summation, already adumbrated a panoramic outline of its Southwest Asian concerns. That was, it had an idea of how its arm there would function - a proposed organization, of what it would have to do - support the airplanes of an entire corps, and which barriers it would face - overcome immediate environmental and tactical threats. Thus, it started with foci against which it could proceed.

Unfortunately, it did not - and would continue to not - proceed alone. The AVSCOM was but one player in the aviation logistics game. The aircraft abroad were, for example, the province of the troops, who could choose to ignore prescribed maintenance procedures, who could buy non-standard aviation items, who could exceed recommended flying hours, and who could do all manner of divers and possibly antithetical-to-the-AVSCOM actions. Other performers were,

⁵²MSG, Mr. James A. Ray, Acting Director of Engineering, AVSCOM, to the CINCSOC, et alia, 31 October 1990, subject: Aircraft Electrical Circuit Breakers.

⁵³MSG, Mr. William S. McDonald, Chief, Maintenance Engineering Division, Directorate for Maintenance, 24 August 1990, subject: Limited Test Flight Waiver for UH-60's (sic) in Operation Desert Shield.

indeed, hierarchically superior to the command, and these could therefore intervene with impunity - and with sometimes adverse effects. The Office of the Deputy Chief of Staff for Operations (ODCSOPS), for instance, could limit the distribution of night vision goggles for aviators to less than one per flyer even though all flyers might be in combat at once. The Army's Logistics Control Activity (LCA) could tie up cargo shipments for weeks because all of the bureaucratic "i"s did not have dots. The list could continue, but the layman should be aware by now that the AVSCOM was not the arbiter of aviation logistics, as its title might imply. Thus, the AVSCOM might advise, might train, might repair, might supply, and might perform a host of supporting functions, but it could not rule. The result was an actual state of aviation logistics which was not anarchy, but which did often resemble relations between the mediaeval Italian city-states.

That the Army was its own worst enemy was not historically novel. The departments, and later the arms and the corps, and still later the technical services, had a long history of being at odds with each other. Indeed, they loathed each other far more than they hated the Navy or, eventually, the Air Force. Thus, the AVSCOM could, in the 1990s, find much grief from its own kin, which depended heavily upon it, while simultaneously enjoying excellent harmony with the Air Force, upon which it heavily depended.

Air-Line-of-Communications (ALOC)

As our caveat ends with the Air Corps, fittingly we shall turn to the most obvious logistical factor which involved that service - distance. Saudi Arabia lay nearly half-way around the world from America - over 10,000 miles and more than 12 hours away by jet cargo airplane. The closest United States (U.S.)

base to the zone of operations was on the British island of Diego Garcia, more than 2,000 miles south and east in the Indian Ocean. Though steaming-time was weeks in such circumstances, the Army decided, in consideration of the size of the expeditionary force, that the only feasible means of shipment was, for 90 percent of the cargo, ship. Exceptions were:

- Class IX (Repair parts)¹
- Class VIII B (Blood and Blood Products),²
Emergency Medical Resupply and Perishable/Short
Shelf Life Commodities

¹Reverse of the normal shipment ratio

²100 percent by air

The Army also decided that the establishment of designated logistical support aircraft for SWA was essential.⁵⁴ In consideration of this, the Joint Chiefs of Staff (JCS) tasked the Commander-in-Chief of the Transportation Command (CINCTRANS) to establish a resupply system to support the operations of the Central Command (CENTCOM) in Saudi Arabia. The Transportation Command (TRANSCOM), an Air Corps element, set up the sequent routes:

⁵⁴MSG, AMSAV-L-EOC, to the AMCOC-RE, 12 August 1990, subject: (Operation Desert Shield).

APOE¹

Dover AFB³

Tinker AFB³

Norfolk

APOD²

Dhahran, S.A.⁴

Abu Dhabi, U.A.E.⁵

Riyadh, S.A.

Seeb, Oman

Cairo International

Airport, Egypt

King Abdul Aziz

International Airport, S.A.

Bahrain International Airport, Bahrain

¹Air Port of Embarkation

²Air Port of Debarkation

³Air Force Base

⁴Saudi Arabia

⁵United Arab Emirates. Abu Dhabi - the state - was one of seven Arab Emirates united under British protection. The others are Ajman, Dubal, Fujaira, Ras al Khaima, Sharja, and Umm al Qaiwan.⁵⁵

⁵⁵MSG, AMCOC-RE, to the U.S. Central Command (CENTCOM), MacDill AFB, Tampa, Florida, et alia, 13 August 1990, subject: Sustainment Resupply Channels.

By late August of 1990, details began to take form. The ALOC "activated," the New Cumberland Army Depot (NCAD) became a containerization and consolidation point, ALOC cargo was to be Class IX (Repair Parts), and certain American units in Saudi Arabia, such as the 782nd Maintenance Battalion, became designated ALOC cargo recipients.⁵⁶

The AMC started to put together supply slugs, or push packages, for deployed units, with delivery times to be 5 days by air and 15 by sea. Supply classes of moment to the AMC were:

- Class II - Administrative and General Supplies;
- Class III - Packaged Petroleum, Oil and Lubricants (POL);
- Class IV - Barrier Materiel;
- Class V - Ammunition and Missiles;
- Class VI - Maintenance Related;
- and, Class IX - Repair Units⁵⁷

⁵⁶1) MSG, AMCOC-SM, HQ AMC, to the CDR, Armament, Munitions, and Chemical Command (AMCCOM), Rock Island, Illinois, 25 August 1990, subject: Activation of Airline of Communications (ALOC). Writer's Note: The AMCCOM was a sister major subordinate command (MSC) of the AVSCOM. 2) MSG, AMCOC-SM, to the CDR, AMCCOM, et alia, 21 August 1990, subject: Activation of ALOC in Support of "Desert Shield." 3) MSG, CDR, Depot Systems Command (DESCOM), to the AMCOC, 30 August 1990, subject: Activation of National Guard (AVCRAD). Writer's Notes: 1) The DESCOM was yet another AMC MSC. 2) AVCRAD means Aviation Classification and Repair Activity Depot.

⁵⁷1) MSG, AMCOC-RE, to the AMXSI-M SIMA (Systems Integration Management Activity), Chambersburg, Pennsylvania, 15 August 1990, subject: Operation Desert Shield Equipment Density. 2) MSG, AMCOC-RE to the CDR, Army Central Command (ARCENT), Fort McPherson, Georgia, 15 August 1990, same subject.

With the enlistment of the National Guard (NG) as an "air line" among factories, depots, Army Air Fields (AAFs), and APOEs,⁵⁸ a materiel distribution system emerged. Linked were the New Cumberland, Red River, and Corpus Christi Army Depots (NCAD, RRAD and CCAD), Forts Hood and Bragg, Campbell and Hunter Army Airfields (CAAF and HAAF), factories at Mesa, Arizona, and Stratford, Connecticut, and Tinker - fed from the RRAD - and Dover - fed from the NCAD - AFBs. From Tinker and Dover, the Air Force flew Riyadh, Dhahran-Abu Dhabi, and Rhein-Main-Dhahran routes.⁵⁹ The volumes of supplies were enormous; the Air Force was using 95 percent of its available aerial cargo-carrying capacity as of 31 August 1990. The AVSCOM supplemented these overseas hauls with a great use of commercial carriers.⁶¹

As in Vietnam, with its lengthy coastline and sparse interior transportation, Saudi Arabia presented distance challenges. Slightly larger than Mexico and about one-quarter the size of the United States, Saudi Arabia, particularly in the zone of operations, consisted largely of water-less wastelands. As in Australia, air was the only appropriate response, and an internal ALOC was soon afoot. The Air Force seemed again to be Army aviation's champion. As of 30 August 1990, the Air Corps had 21 bases in the area and considerable C-130 strength:

⁵⁸MSG, AMCOC-RE-PO, to the DALO-OC, 25 August 1990, subject: AMC SITREP No. 010.

⁵⁹AVSCOM Pamphlet, Desert Shield Aviation Logistics, circa 15 September 1990.

⁶⁰MSG, AMCOC-RE, to AIG (Addressees in General), 31 August 1990, subject: (Operations of the Last 24 Hours).

⁶¹Speech, General Tuttle, CDR, AMC, to the Product Support Symposium, 6 February 1991.

<u>Air Base</u>	<u>Air Cargo Airplanes</u>
Riyadh	4 C-21s, 1 C-20
Thumirat	16 C-130s
Bateen	16 C-130s
Masirah	16 C-130s
Al Air	16 C-130s
Sharjah	3 C-130s ¹

¹With 29 more on the way.

The Air Force flew 114 sorties with this arm on 29 August 1990, and it had 13 more C-130s at Alconbury in England ready for assignments.⁶² Unfortunately, this air arm would, from the Army's viewpoint, remain largely untapped.

On a more modest scale, nine C-12s, eight of them Air Force, were available:

<u>Station</u>	<u>Aircraft</u>
Riyadh International	1 C-12
Airport (U.S. Embassy Use)	
Riyadh Military Airfield	4 C-12s (Air Force)
Dhahran Military Airfield	4 C-12s (Air Force)

A contractor, Beech Aerospace Services, International (BASI), was to support these C-12s and the recently deployed U-21s.⁶³

⁶²MSG, DALO-AV, to the AVSCOM-L-EOC, 6 September 1990, subject: (Intra-ALOC).

⁶³MSG, AMC Project Manager - Fixed Wing (AMC-PM-FW), to the DALO-AV, 30 August 1990, subject: Maintenance Support for Operational Support Airlift (OSA).

The Personal Connexion: The Establishment

While the aerial means of moving men and equipment about assumed an ever-augmenting form, the AVSCOM established, and rapidly reinforced, a direct personal connexion between itself and the troops it was to support. The stateside part of this nexus was the Directorate for Readiness's Emergency Operations Center (EOC). Activated for the operation at 0830 hours on 7 August 1990, the EOC began operating around-the-clock at 1400 hours the next day.⁶⁴ The EOC provided a constant, and oftentimes only, channel of communications between the Headquarters, AVSCOM, and aviation representatives in the zone of operations. On that latter end, the AVSCOM became part of an AMC scheme . . .

"1. It is the intention of this headquarters to deploy an AMC Forward to represent AMC, coordinate AMC requirements, and support US forces deployed under Operation Desert Shield. This concept of AMC Forward has been forwarded to (the) Commander, U.S. Army Central (ARCENT) for concurrence.

"2. COL Robert Lytle, Chief, LAO CONUS (Logistics Assistance Officer Continental United States) has been designated as Chief, AMC Forward Each MSC is required to designate a senior command representative (SCR) who will be under the command and control of COL Lytle."⁶⁵

⁶⁴MSG, AMSAV-L-EOC, to the AMCOC-RE, et alia, 9 August 1990, subject: Activation of AVSCOM EOC.

⁶⁵MSG, AMCOC-RE, to the AVSCOM-L-EOC, et alia, 12 August 1990, subject: (AMC Forward).

The operation began under, and laboured on with, overly stringent security restrictions

"1. Current Middle East crisis has been named Operation Desert Shield. Desert Shield used alone is not classified, however, if used in conjunction with "Middle East" or countries in Southwest Asia, it becomes secret."⁶⁶

The first AVSCOM representative, or the AVSCOM Forward, on the AMC Forward contingent was Lieutenant Colonel (LTC) James L. Beahon. The LTC and the rest of the AMC contingent departed for Atlanta on 16 August 1990, later to join, on 19 August 1990, Major General (MG) Pagonis' Army Central (ARCENT) Support Command (SUPCOM) in Dhahran, Saudi Arabia. The contingent became the wholesale supply connexion with the CONUS for the units in the theatre; LTC Beahon's particular, and immediate, concerns were to fulfill such a role for the AVSCOM, to handle all aviation issues in the theatre, and to start putting the aviation organizational support structure in place. His success was such that he received many visitors from the units. During his three months as the AVSCOM Forward, LTC Beahon watched his strength grow to about 160 people, most of whom were IARs and CFSRs with the troops, and about 10 of whom helped the colonel to administer his program; oversaw the establishment of the AVSCOM's Theater Aviation Maintenance Point (TAMP)-Forward at Dhahran, S.A., and the TAMP-Base at Abu Dhabi, U.A.E.; established a means for aviation units to find aviation

⁶⁶MSG, AMCOCC-RE, to the CDR, DESCOM, et alia, 9 August 1990, subject: Operation Desert Shield.

items at the vast Air Force Cargo Release Point; ordered, received, and handled critical aviation items for units; and performed a host of other functions in an 18-hour-a-day, 7-day-a-week job. Problems included extremely limited communications, austere living conditions, the provision of host country support by a nation which practiced five 2-hour prayer periods daily and siestas in the summers, and a difficult combination of lengthy road distances and few, exorbitantly-priced rental cars.⁶⁷

The Personal Connection: The Contractors

To help him address all of these problems, LTC Beahon needed, so to speak, an army, and such actually began to assemble before his arrival. Two LARs and four CFSRs left with the 82nd Airborne and were already in Dhahran by the 12th of August,⁶⁸ seven days before he arrived,⁶⁹ and there they came to be joined by representatives from a large contractor force in the zone of operations. As noted in the first pages of this text, CFSRs were to be irreplaceable cogs in the AVSCOM flag force. They came to constitute, and would steadily continue to be, about 70 percent of the command in the zone of operations. There were three advantages to the use of CFSRs. One, they already had training; two, they were there; and three, they enabled the AVSCOM to carry far fewer permanent maintenance specialists.

⁶⁷Interview, Howard K. Butler with LTC James L. Beahon, 30 November 1990.

⁶⁸MSG, AMSAV-L-EOC, to the AMCOC-RE, 16 August 1990, subject: Operation Desert Shield.

⁶⁹MSG, AMCOC-RE, to the AVSCOM-L-EOC, 20 August 1990, subject: TAMP-SA.

LTC Beahon, moreover, had direct experience with many of the CFSRs. For some years, the Saudis had been spending billions of dollars building huge bases, particularly for airplanes, had been accumulating modern military equipment of all types, and had been training its men for war. The AVSCOM had a share in this, being a partner in the Saudi buys of a number of two helicopter models - Desert Hawks - UH60s especially modified for desert warfare - and Bell 406 Combat Scouts. In the 1st Quarter of FY90, the AVSCOM's Directorate for International Logistics established a Saudi Arabian Land Forces Army Aviation Command (SALFAAC) Management Office Saudi Arabian Branch to oversee the preparations for the January 1990 delivery of UH-60As to the desert kingdom. Deliveries of the Bell 406 Combat Scouts and the UH-60L Desert Hawks followed. On 8 January 1990, the SALFAAC Saudi Arabian Branch dissolved, being replaced by a Saudi Arabian Programs Officer.⁷⁰ Then, in August 1990, LTC Beahon, the Program Manager, went to Saudi Arabia to become, as forenoted, the first AVSCOM Forward, and the AVSCOM modified a Foreign Military Sales (FMS) agreement with the Saudis to meet Army needs.⁷¹

Some notion of the continuing Army reliance on contractors, which had been a fixation since Vietnam,⁷² appears in the following:

⁷⁰AVSCOM Permanent Order Number 5-2, 17 January 1990.

⁷¹AVSCOM Annual Historical Review, FY1990, Directorate for International Logistics Chapter.

⁷²Writer's Note: The Army's intention to fashion its own such force, to be based at Fort Rucker, Alabama, foundered with the congressional budget cuts of 1972.

" . . . (the AVSCOM (is) concentrating on contracts on (sic) TAMP-SA
.(for) general maintenance support with verbal approval, modifying FMS (Foreign Military Sales) contract with Sikorsky Internal Products, Incorporated (SIPI)
.Lear Siegler, Incorporated, has (a) large in-country workforce supporting AF (Air Force) FMS.
.(the) AVSCOM has current contractual arrangements with the Air Force to provide aircraft modification and general field maintenance teams with 1,228 personnel contract (sic) who are prepared for deployment and are immediately available.

"B. We are in the process of establishing a generic special repair activity (SRA) that will provide one-stop services for aviation customers.

(1) Martin Marietta is under contract to provide (sic) and will deploy an AH-64 T/P SRA.

(2) PM AHIP (Army Helicopter Improvement Program, or OH-58D) is under contract through (the) MICOM (Missile Command - another AMC MSC, based in Huntsville, Alabama) with McDonnell Douglas Electronics Systems Corporation (MDESC) to establish a deployable AHIP MMS (Mast Mounted Sight) SRA.

(3) Coordination is underway with MICOOM/AMC to have their contracts modified or provide LAR support for their special systems, and to deploy/collocate their assets with the AVSOM-managed generic SRAs.

"C. CFSRs -

AH-64-MDHC (McDonnell Douglas Helicopter Company), MM and GE (General Electric)

AH-1H - Bell and MDSC

UH-60 - Sikorsky and Lycoming

CH-47D - Boeing and Lycoming

"E. AVSOM PM Saudi (LTC Beahon) is in charge of aviation logistics and will deploy with AMC LAO (Logistics Assistance Office) team - AVSOM LARs, CFSRs, TADS/PNVS SRA, and CONUS (Continental United States)-based aviation maintenance personnel are available for deployment to augment aviation units."⁷³

All of the above points reappeared the next day in the ODCSLOG's

" Direct Support Aviation Logistics Concept
(to be brought about by)

- Establishing a theater aircraft maintenance program - Saudi Arabia
- Modifying (the) FMS Contract with SIPI
- (Establishing a) working contract with LSI

⁷³MSG, AMSAV-GLD, Logistics Center, HQ, AVSOM, to the AMCRE, 16 August 1990, subject: Operation Desert Shield.

- Utilize existing contract with (the) Air Force
- Establishing (an) SRA
- (and) Deploying CFSRs.⁷⁴

.and in virtually a word-for-word same-day summation by the Logistics Director.⁷⁵

A great number of special repair concerns would be mainly or wholly the province of contractors. Examples were the Army Oil Analysis Program (AOAP),⁷⁶ the MMS,⁷⁷ and all but one of the four major Army helicopter engines - the T-53, the T-55, and the T-700.⁷⁸ It was unsurprising, then, that the TAMP-SA, by 18 August 1990, had already projected a requirement for 500 contract personnel, and that priority requirements were chemical protective clothing and agent antidote kits for deploying personnel.⁷⁹

⁷⁴FAX, Captain (CPT) Craddock, DALO-AV, ODCSLOG, to the AVSCOM-L-EOC, circa 16 August 1990, subject: Aviation Logistics Support.

⁷⁵MSG, AMSAV-GLD, Logistics Director, HQ, AVSCOM, to the DALO-AV, ODCSLOG, 16 August 1990, subject: Aviation Maintenance Support Concept.

⁷⁶1) MSG, Commander, Materiel Readiness Systems Activity (MRSA), Lexington, Kentucky, to the Commander-in-Chief, Forces Command (CINCFOR), Fort McPherson, Georgia, 25 August 1990, subject: Contractor Laboratory for Army Oil Analyses Program (AOAP) Support for Operation Desert Shield. 2) MSG, CDR, MRSA, to the AMXMD-MO, AMC, circa 23 August 1990, subject: AOAP Support for Operation Desert Shield. 3) MSG, AMSAV-L-EOC, to the CDR, JCSE, MacDill AFB, et alia, 23 August 1990, subject: Interim Aviation Oil Analysis Support for Deployed Aircraft. Writer's Note: The last reference mentioned a need to screen 10,000 samples per month.

⁷⁷MSG, AMCOG-RE, to the DALO-LOC, 29 August 1990, subject: AVSCOM - MMS Special Repair Activity (SRA).

⁷⁸MSG, AVSCOM-L-EOC, to the AMCOG-RE, 19 August 1990, subject: (Operation Desert Shield). Writer's Note: Faulting the T-63.

⁷⁹MSG, AMSAV-M, Directorate for Maintenance, HQs, AVSCOM, to the AMCOG LAPA, 18 August 1990, subject: Support of Contract Personnel in Country.

The team concept, which would eventually appear, ad nauseum, in virtually every AVSCOM Southwest Asia action - Team Cobra, Team Blades, Team Glass, Team Covers, and so forth - first reared itself in contractor deployments.

" The initial one of these Contract Field Teams (CFT) (was) made up of sheetmetal, electrical, armament repairmen and general aviation mechanics . . .," or 30 men; it began movement on 23 August 1990 and was to enter the zone of operations on 27 August 1990.⁸⁰

Shortly, this team would, with others, account for the following operations:

<u>Type Activity</u>	<u>AH-1</u>	<u>OH-58D</u>	<u>UH-60</u>	<u>CH-47D</u>
SRA	MM ¹	MD ²		
	T/P	MMTS		
CFSR	MD	Bell	Sikorsky	Boeing
	MM ¹	MD ²	GE ³	Lycoming
	GE ³			
Back-Up		DynCorp		
AVUM ⁴ -AVIM ⁵				
Limited Depot				

¹Martin Marietta

²McDonnell Douglas

³General Electric

⁴Aviation Unit Maintenance

⁵Aviation Intermediate Maintenance

⁸⁰MSG, AMSAV-L-EOC, to the AMCOC-RE, 23 August 1990, subject: AVSCOM Aviation Activity. Writer's Note: Thanks to the bureaucracy, the quickest leg of one's multi-day deployment to Southwest Asia was the few hours one spent aboard an aeroplane.

The AMC and its MSCs complemented the contractors with LARs and used LARs to do armament work. Particularly useful was the Depot System Command's (DESCOM's) Corpus Christi Army Depot (CCAD), a 4,000-man Army aviation depot repair facility in the Texas city of the same name and an AVSCOM subordinate from 1961 to 1974.⁸¹ Nevertheless, the contractors bore the bulk of the load and, on 26 September 1990, the AMC was able to report that it had duration-length contracts for:

- Theater Aviation Maintenance Program - Saudi Arabia
 - Aviation Components
 - Navigation/Vision Systems
 - Intelligence/Electronic Warfare (IEW)
- Communication/Electrical Special Repair Activity (SRA)
 - Mobile Subscriber Equipment Repair Support Center
 - Computer/Switching System
 - Other IEW
- Patriot Support Center
- Dock-side Maintenance Equipment
 - Aircraft/Wheeled Vehicles
 - Direct Support to Component Repair⁸²

The contractors enabled the TAMP-SA to carry out its mission to " . . . provide theater aviation support for passback AVUM/AVIM, (for) forward

⁸¹MSG, DALO-AV, ODCSLOG, to the AVSCOM-L-EOC, 9 September 1990, subject: Aviation Support.

⁸²MSG, AMCOC-RE, to the AVSCOM-L-EOC, circa 26 September 1990, subject: Contract for Duration of Operation.

AVUM/AVIM augmentation and (for) limited aviation depot support."

Particularly, they addressed two of the five immediate needs of the TAMP-SA Forward for armament, structural repair, technical assistance, supply, and a dedicated ALOC.⁸³

The Personal Connexion: The AVSCOM Reduction-in-Force

On Wednesday, August the 8th, 1990, the AVSCOM, as part of an overall plan to cut the Army from 18 to 10 divisions and slash the AMC from 105,000 to 35,000 over a 4-year period, issued reduction-in-force (RIF) notices to hundreds of its employees. Despite its 4,000-plus size, the letters affected such a broad scope of positions that the almost immediately ensuing Desert Shield operations could not avoid an adverse impact. On 6 September 1990, the AVSCOM reported to the AMC that 180 of its headquarters spaces were at work on Desert Shield and that it had already paid 10,887.5 hours of overtime for that operation.⁸⁴ The AMC would give the AVSCOM 160 spaces for Desert Shield.⁸⁵

⁸³Fact Sheet, AVSCOM-L-EOC, to the AMOC-RE, 23 August 1990, subject: TAMP-SA Concept.

⁸⁴Memorandum, Chief of Staff (CS), AVSCOM, to Mrs. Maureen Miller, AMOCS, HQ, AMC, 6 September 1990, subject: Desert Shield Impact on AMC FY91 Reduction in Force (RIF).

⁸⁵Historian, Notes on Desert Shield Conference, 5 October 1990. Herein abbreviated as NDSC. Notes: 1) The AVSCOM pared its requests to 172 spaces. 2) This writer took these notes at these conferences from Monday through Friday. 3) After 17 January 1991, NDSC means Notes on Desert Storm Conference.

The Personal Connexion: Saudi Arabia and the National Guard

Mentioned only implicitly heretofore, the Saudis -- and their facilities -- were invaluable for the desert deployment. By 21 August 1990, the AVSCOM noted that it had an ". . . . agreement with (the) Commander/Royal Saudi Land Forces Army Aviation Command (RSLFAAC) to provide full support and cooperation . . . (which) includes tools, equipment, facilities, spare parts, and components to (the) extent available plus (the) climate controlled hangar at King Khalid Military City (and) SIPI help (as well as) authorization to contract with SIPI for more support"

On the home front, the National Guard's (NG's) small, C-12 fixed-wing (FW) airplanes were also very important. They carried high priority about the United States for the AVSCOM -- 748 pounds (lbs) on 20 August 1990, for example.⁸⁶

Parts

With its support force a-forming, the AVSCOM turned the bulk of its attention to supply -- or, more specifically, to parts. Spurred by its commander, the AVSCOM developed what, in psychological terms, was a severe parts fixation. This neurosis took three forms: one, the immediate supply of those parts which kept an aircraft on the ground, or an AOG, as the AVSCOM dubbed it; two, an emphasis on the flow of those critical so-called Aviation Intensively Managed Items (AIMI); and three, the accumulation of a huge parts cache in the zone of operations -- at least, initially, a 30-day supply, or more than 100,000 battlefield spares, with secondary and tertiary goals of 60- and 90-day hoards, respectively.

⁸⁶AVSCOM SITREP EXTRACT, AVSCOM-L-EOC, to the AMCOC-RE, 20 August 1990, subject: Extract from AVSCOM SITREP.

As early as 13 August 1990, the AMC supplied its MSCs with an initial list of key items for Desert Shield. Aircraft items were for the AH-1, UH-60, EH-60, CH-53, CH-46E, and AH-64 helicopters.⁸⁷ A similar AVSCOM list, issued the previous day, showed the UH-60, AH-64, and AH-1 as parts recipients.⁸⁸ Whatever the account, push packages began to go out for a variety of items - such as batteries, tires, and, not incidentally, aviation parts.⁸⁹ Certain units, such as the 24th Infantry Division (Mechanized) (ID(M)), became package targets;⁹⁰ and the AVSCOM Forward started sending lists of deficient items to the AVSCOM.⁹¹

Items: AIMI

The larger counterpart to critical parts was critical items or, in a description coined during the Vietnam war, Aviation Intensively Managed Items (AIMI). AIMI for Southwest Asia surfaced as an issue by 29 August 1990,⁹² and the AVSCOM rapidly took action to

⁸⁷MSG, AMCOG-SM, HQ, AMC, to the CDR, AMCCOM, et alia, 13 August 1990, subject: CINC Critical Item List.

⁸⁸MSG, AMSAV-SAB, HQ, AVSCOM, to the AMCOG-SM, 12 August 1990, subject: CINC (Commander in Chief) Critical Items List (Desert Shield).

⁸⁹MSG, AMCOG-RE, to the CDR, AMCCOM, et alia, 1 September 1990, subject: Identification of "Push" Packages.

⁹⁰MSG, AMCOG-RE, to the AVSCOM-L-EOC, 7 September 1990, subject: (Readiness Charts).

⁹¹MSG, LTC Beahon, AVSCOM Forward, to the AVSCOM-L-EOC, 6 September 1990, subject: SITREP.

⁹²MSG, AMCOG-RE, to CDR, AMCCOM, et alia, 29 August 1990, subject: AMC-SWA SITREP 13, 29 August 1990.

" establish (a) prepositioned stockage level of each AIMI item for use in country to support all aviation units involved in Operation Desert Shield. The name of the package is "AIMI Plus."

The AVSCOM held the stock at the Red River Army Depot (RRAD) in Texarkana, Texas, until storage was ready in Saudi Arabia.⁹³

Such storage was forthcoming 4 days later, and 339,000 pounds of AIMI began the long journey from Texarkana.⁹⁴

The AVSCOM set the AIMI numbers at 142.⁹⁵

Items: Classifications

For the information of the civilian or non-logistical military reader, parts and items were different. Although the Army had ten classes of supplies, basically three kinds will be of interest in this text:

- Class IX, Repair Parts and Components. These, just discussed, included kits, assemblies and sub-assemblies, reparable and nonreparable, required for the maintenance support of all equipment.

- Class VII, Major End Items. These were, in Army terms, final combinations of end products, such as tanks, trucks, mobile machine shops, and helicopters. Class IX entries supported this class.

⁹³MSG, AMSAV-SAAO, HQ, AVSCOM, to the AMCCO-RE, 7 September 1990, subject: Prepositioning on Aviation Management (sic) Intensively Managed Items (AIMI), AIMI Plus.

⁹⁴MSG, CDR, XVIII Airborne Corps, to the COMUSARCENT, 11 September 1990, subject: Aviation Logistics Support.

⁹⁵NDSC, 15 October 1990.

- and, Class II, Items of Equipment, other than principal items. These included clothing, individual equipment, tool sets and tool kits, and, interestingly, major assemblies, such as \$800,000 aircraft engines. Some of these items were consumables, such as the tool kits; some, such as the engines, were not.

Two sub-class designations deserve mention, as well. These were A, for Air, and H, for Test, Measurement and Diagnostic Equipment (TMDE). Thus, an AVSCOM entry in Class IX made that entry a Class IX A one. The H sub-class basically consisted of electronic gadgets to diagnose the health of an operational unit, such as an aircraft engine. H generally fell under Class IX, but it could fall under Class II.

Finally, many supplies used by aviation such as fuel - Class III - or ammunition - Class V - lay in the province of other commands.⁹⁶

Items: Particulars

With the above caveats in mind, the AVSCOM had, in addition to regular AIMI, many items which merited especial attention. Some of these, a few of which appeared earlier in the countermeasures section, were:

- the M-43 Protective Mask for AH-64 crews;⁹⁷

⁹⁶Army Regulation (AR) 700-9, Classes of Supply, March 17, 1983, page (p.) 15.

⁹⁷MSG, DAMO-FOV, HQ DA, to the AMCDE-S, HQ, AMC, 27 August 1990, subject: M43 Protective Masks for AH-64 Units Deploying to the Middle-East.

- eye protection - items included Light Amplified by the Simulated Emission of Radiation (LASER) Eye Glasses (LEGs) for the SPH-4 Aviator's Helmet and the IHADSS;⁹⁸

- and a filter to protect gunners against lasers;⁹⁹

- aircraft covers and sun screens for canopies, cockpit interiors, rotor blades and weapons;¹⁰⁰

- mooring kits to tie down the XVIII Airborne Corps' aircraft;¹⁰¹

- airfield matting;¹⁰²

- AVUM and AVIM shelters;¹⁰³

- anti-erosion paint;¹⁰⁴

- Apache tail rotor swashplates;¹⁰⁵

⁹⁸1) MSG, DAMO-FDM, HQ DA, to the Program Executive Officer (PEO), Aviation, 7 September 1990, subject: Directed Procurement of Laser Eye Glasses (LEGs) for SPH-4 Aviators' Helmet and IHADSS. 2) Memorandum (Memo), SFAE-AV-CAS-T, PEO, Avn, to the PM, TADS/PNVS, et alia, 6 September 1990, subject: Laser Eye Protection for Apache and Cobra Crews.

⁹⁹MSG, CDR, MICOM, to the CDR, DESCOM, 20 September 1990, subject: M65 Optical Improvement, Operation Desert Shield.

¹⁰⁰MSG, AMCOC-RE, to the DALO-LOC, circa 19 September 1990, subject: AMC SITREP 36.

¹⁰¹MSG, CDR, XVIII Airborne Corps, to the CDR, AVSCOM, 26 September 1990, subject: Aircraft Mooring Kits, Direct Support.

¹⁰²MSG, AMCOC-RE, to the CDR, AMCCOM, et alia, 22 September 1990, subject: (Air Field Matting).

¹⁰³MSG, AVSCOM-L-EOC, to the DALO-AV, ODCSLOG, 23 August 1990, subject: (Shelters).

¹⁰⁴MSG, AMCOC-RE, to the AVSCOM-L-EOC, 5 September 1990, subject: Extract from SITREP, 0600 EDT (Eastern Daylight Savings Time), 5 September 1990.

¹⁰⁵MSG, AMSAV-L-EOC, to the AMCOC-RE, 11 September 1990, subject: SITREP.

- acrylic-coated windshields to replace crazed windows;¹⁰⁶
- radar altimeters for the UH-1H fleet;¹⁰⁷
- blade erosion tape kits;¹⁰⁸
- Aviation Vibration Analyzers (AVAs)¹⁰⁹
- high capacity vacuum cleaners, or Shop-Vacs;¹¹⁰
- and, the Cover Helicopter Aircraft Protection System (CHAPS).¹¹¹

Summary

Some of the above reiterations appeared in order to reinforce the notion that the AVSCOM placed its major emphasis upon parts. This emphasis, moreover, started with MG Donald R. Williamson, the AVSCOM's Commander:

"1. The main focus, of course, is on aircraft parts. We are accelerating production and delivery schedules, surging maintenance and overhaul programs, initiating new procurements, and establishing theater depot

¹⁰⁶MSG, AMSAV-L-EOC, to the AMCOC-RE, 15 September 1990, subject: SITREP.

¹⁰⁷1) MSG, AMSAV-L-EOC, to the COMUSARCENT SUPCOM (PROVISIONAL), 15 September 1990, subject: Information Update No. 6A. 2) MSG, UH-1 PM, to the COMUSARCENT SUPCOM (PROVISIONAL), 19 September 1990, subject: (Radar Altimeters).

¹⁰⁸MSG, AMSAV-L-EOC, to the AMCLO-TMP, HQ, AMC, 23 September 1990, subject: (Blade Erosion Kits).

¹⁰⁹MSG, AMSAV-L-EOC, to the AMCOC-RE, 28 September 1990, subject: SITREP-RADS-AT (Aviation Vibration Analyzers) (AVA).

¹¹⁰MSG, AMSAV-L-EOC, to the AMCLO-TMP, HQ, AMC, 29 September 1990, subject: SITREP No. 51.

¹¹¹MSG, AMSAV-L-EOC, to the AMCOC-RE, et alia, 5 October 1990, subject: (CHAPS).

maintenance programs to improve inventory. We have positioned AIMI stocks in theater and will keep them filled so that they are always available for immediate issue. We are refining the requisition-distribution system and are asking our customer units to requisition replenishment ASI-PLL stocks using their primary code and priority, NMCS (Not Mission Capable, Supply) only for Anticipated Requirements TBO (Table of Basic Organization), erosion projections, and a call-in system for actual NMCS when aircraft are on the ground (AOG) for parts. This way, we can keep the parts flowing to replenish stocks and recognize and expedite the real NMCS; our goal is 72 hours UPS (United Parcel Service) delivery.

"2. We are in the process of establishing audio warning in the radar altimeters and have developed and issued ballistic blankets, sling kits, combat phase inspection procedures, aircraft and component covers, and blade erosion kits.

"3. We have established a theater aircraft maintenance facility-forward at Dhahran and a base at Abu Dhabi with team and special repair activities to assist aviation units when technical or logistical situations exceed their capacity.

"4. The 24th Aviation Brigade has erected the first clamshell "hangar" shelters with 40 more delivered . . .

"5. We have 22 AH-1F Cobras ready for delivery

"6. We've heard (that) the Apaches and BLACK HAWKS are pushing 40 (flying) hours per aircraft per month. At this rate and (with an adverse) aviation environment factor (we) will be hard pressed to sustain your readiness expectations we could support . . from 14 to about 20 hours per aircraft per month (so that) the remainder of the fleet (can) train and (have) parts available should you need to surge. We need to have this kind of balance and will work with you to insure (that) your crews maintain their warfighting edge. The VCSA (Vice Chief of Staff, Army) approved float aircraft for theater at approximately 10 percent per system of your fielded fleet. We will coordinate delivery and assist in developing a float plan that I envision as a DX/RX (Direct Exchange/Reparable Exchange) system to replace damaged aircraft or when a long down time is anticipated

"7. (We are) at work to improve blades and turbines

"8. (We) want to improve parts availability (and) durability (and) communication through better (sic) requisition processing and dedicated transportation for the on-time delivery of AOG components."¹¹²

The AMC and Aviation Desert Operations

Background

As mentioned before, the AVSCOM was not entirely unaware of special demands which the forbidding desert might impose upon Army aircraft. Indeed, as early as May of 1981, the Aviation Research and Development Command (AVRADCOM), an AVSCOM predecessor organization, summarized these obstacles in a publication entitled Army Helicopter Desert Operations. This booklet discussed problems and solutions in three areas - equipment design, publications, and logistics. Its comprehensive approach made it, in effect, an AVSCOM primer for Desert Shield, and, therefore, worthy of some review. For example, it listed the two chief problems as one, sand and dust, and, two, heat. The former

- caused major erosion problems for rotor blades, turbine engine compressors, windshields and other exposed airplane surfaces;
- was particularly harmful in low altitude hovering;
- and required stringent maintenance procedures, especially cleaning, for filters, lubricated joints, electronic gear, optics and optical equipment, covers, and weapons.

¹¹²MSG, MG Donald R. Williamson, CDR, AVSCOM, to the ARCENT Forward, AMC-SWA, 3 October 1990, subject: Desert Shield Aviation Support.

The latter necessitated heat protective clothing for aircraft workers, shields for electronic gear and optics, and higher re-supply rates for lubricants, plastics, pressurized containers, batteries, and components affected by the corrosion resulting from plummeting nighttime temperatures and its accompanying condensation.

Other problems were the effect of unrelenting sunlight on plastic and nylon webbing, the vast stretches of flat terrain that induced navigation difficulties and pilot boredom, and the thin rock and sand terrain cap that damaged tires and bogged down aircraft.

The report proceeded to discuss problems, and solutions, common to the operations of the AH-1S, UH-1F, OH-58A/C, UH-60A, and CH-47C/D. Chief amongst these were:

- sand, which caused erosion of leading edge abrasion strips, tip caps, and blade skins, to be avoided by flying higher and not hovering and, long term, by the development of a more erosion-resistant material;
- flat, vast, open terrain, which induced errors in judgement of distances and altitudes, to be overcome only with radar altimeters, coupled with an audible warning device;
- nap-of-the-earth (NOE) flying, which prevents frequency modulated (FM) radio communications, to be bypassed by the installation of high frequency (HF) radios;
- long distances, which made navigation difficult, to be avoided, partially, by the use of Doppler radio-detection-and-ranging (radar), although smooth surfaces often disengaged Doppler;

- nighttime in the desert, which the second-generation night-vision goggles (NVGs) and incandescent cockpit lighting did not overcome, to be surmounted by the third generation of NVGs and by electroluminescent lighting strips in the cockpit;

- landing light "whiteouts" at night from reflections from the sand, to be remedied, if possible, by a light shield and a special lens;

- the combined drastic effects of heat and sand on seals, gaskets and bearings, to be mitigated by frequent cleanings and lubrications;

- and the contrast of the standard infrared (IR) paint schemes with the desert, to be undone by the use of desert camouflage paint.

Sand was either the sole or major participant in virtually all of the above problems. It clogged vents, pitted compressor blades, jammed components, pitted or scratched glass and plastic, and accumulated in all openings and mechanisms. A variety of measures mitigated, but did not wholly solve, sand problems; these included cleaning, covering, and the use of many different kinds of filters.

Aircraft and aircraft parts aside, the report cited several ground support equipment requirements, to wit:

- a maintenance shelter for concealment and protection from blowing sand;

- a portable air compressor to blow sand out of equipment;

- a portable vacuum cleaner to suck up sand;

- engine cleaning equipment for all helicopter engines;

- improved ground handling wheels that would enable AH-1S, UH-1H, and OH-58A/C helicopters to negotiate sand;

- wash equipment for the removal of sand, dust, and chemical, biological, and radiological (CBR) contaminants;
- portable light sets for night maintenance and operation;
- improved air conditioners for AVIM shop sets;
- transport wheels for shop sets in the desert;
- and an improved ground power unit with sufficient current to perform AH-1S armament system checks.

The report concluded with a call to rectify technical manuals (TMs) to account for desert operations and to address the deficiencies noted on a priority basis.¹¹³

Subsequent to the report, the co-exercise with Egypt in the eastern Sahara, Bright Star '83, confirmed many of the report's findings. Items of note were engine flushes after each flight, the absolute need for radar altimeters for sand avoidance, and the lack of appropriate communications and camouflage. The latter document did include some different features, the most significant of which was a call for the development of smaller, more manoeuvrable airframes, with simple maintenance requirements.¹¹⁴

Addressment

The AMC, in large, and the AVSCOM, in small, now came to face those desert problems of which they had long been aware, but which, primarily because of

¹¹³John Stanfield, HQ, AVRADCOM, Army Helicopter Desert Operations, Saint Louis, Missouri, May 7, 1981.

¹¹⁴Report, Bell Helicopter Textron International (BHTI), Bright Star 83 Aviation Maintenance Lessons Learned, Hurst, Texas, 1983.

funding restrictions, they had been unable to address. In relations with other nations, it is a helpful dictum that one's foreign and military policies should be mutually supportive, particularly if the former often relies upon the latter. Thus, America, which prided itself upon its ability to deploy anywhere at any time in the world, did not have an army, in this instance, fully ready for the field in which this president placed it.

Trouble, moreover, seldom comes in ones. The decision to dispatch airplanes by air and airplanes supported by sea was a disaster. Often the intervals in arrival times between the two were weeks. This forced the aviation logistics community to fight a two-front war. On one side, it had to meet the extraordinary demands of that zone of operations; on the other, it had to act as a surrogate for the missing logistic elements of the deploying units. Unfortunately, the two-front war would persist; by the time their logistics folks had arrived, the units were already hopelessly addicted to this special succor.

For the AMC and the AVSCOM then, the word was, as it was with the Australians in the Spring of 1942, *must*. The pair decided, furthermore, to complicate their own tasks; they chose to try to anticipate requirements. Thus a triad of tasks took shape: one, a frantic attempt to meet special desert demands which should have long ago been addressed; two, a commitment to provide substitute support to units that proved unending; and, three, the institution of a predictive, pervasive logistics policy.

Hence, the aviation logistics support to the zone of operations was three-phased: pre-deployment, deployment, and continuing support, or, to use a recent word in vogue, sustainment. In order, these phases chiefly involved:

- one, pre-deployment -
 - quick reaction team support to deploying units at their home bases;
 - the dispatch of specialists to ports to assist in the loading of combat goods;
 - the acceleration of production and deliveries;
 - the fill of Prescribed Load Lists (PLIs) and Authorized Stockage Lists (ASIs);
 - the expedition of supply parts (Not Mission Capable, Supply - NMCS);
 - and the provision of assistance by LAOs and IARs for a variety of tasks.
- two, deployment -
 - the establishment of AMC-SWA;
 - the development of Class II, IIIP, IV, and IX Resupply Packages;
 - the provision of both initial contractor support to augment unit maintenance;
 - the arrangement for the initial "call-in" of Class IX requisitions until the COSCOM began to work;
 - and the dispatch of LAO and IAR support to arriving units.
- and, three, sustainment. From September 1990 to 1 November 1990, the zone of operations had 3,551,157 Class IX requisitions. The AMC filled 3,471,867, or 98 percent, of these. "Off line" requisitions, or the call-ins just listed, started at 65 to 70 percent of all requisitions, decreasing 35

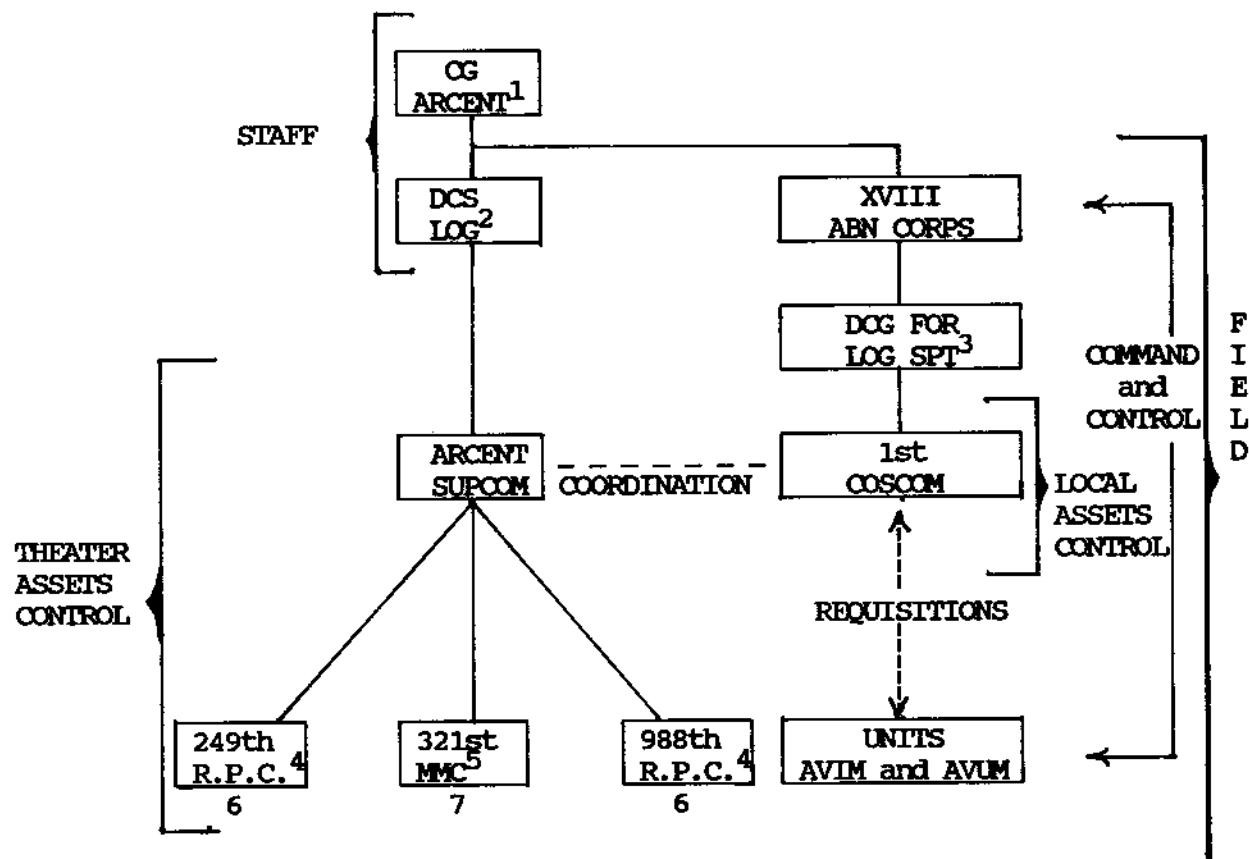
days later to 5 to 10 percent. The AMC, in addition, continued to press resupply packages, and it began to station a large force in Southwest Asia. By 8 November 1990, this contingent consisted of 1,072 personnel, dividing into 198 soldiers, 253 Army civilians, and 621 contractors. The AVSCOM's share of this was quite large, being 9 military, 37 civilians, and 220 contractor personnel, or 266 in total. The nearest AMC MSC in numbers to the AVSCOM was the TACOM, with 106. The AMC force bore the designation Army Support Command (Provisional), or ARCENT SUPCOM (PROV).

Located at King Abdul Aziz Air Base just outside of Dhahran, the ARCENT SUPCOM (PROV) supported, by 1 November 1990, these five major combat units:

- the 82nd Airborne Division (ABN DIV);
- the 1st Cavalry Division;
- the 101st ABN DIV (Air Assault) (AASLT);
- the 3rd Armored Cavalry Regiment (ACR);
- and the 24th Infantry Division (Mechanized) (24th ID(M)).¹¹⁵

¹¹⁵Briefing, AMC, the AVSCOM portion of the AMC structure, AMC Support to SWA, 9 November 1990.

The AVSCOM's part of the AMC community in Southwest Asia operated under the following somewhat informal layout:



¹Commanding General, Army Central Command

²Deputy Chief of Staff for Logistics

³Deputy Commanding General for Logistics Support

⁴Repair Parts Company

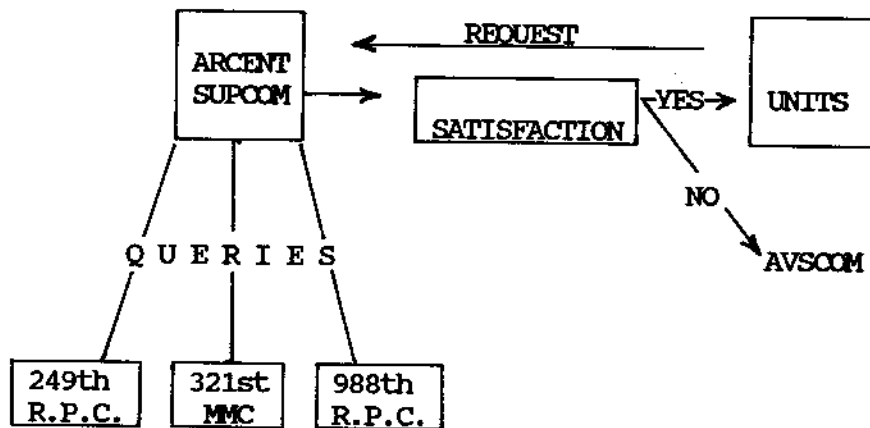
⁵Materiel Management Center

⁶The RPCs performed storage and issue functions.

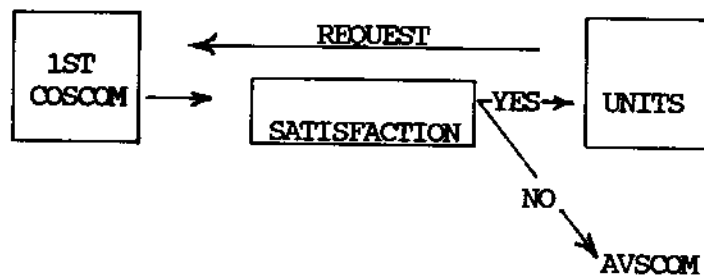
⁷The MMC provided overhead.

The requisitions flow out of this maze was 2-pronged:

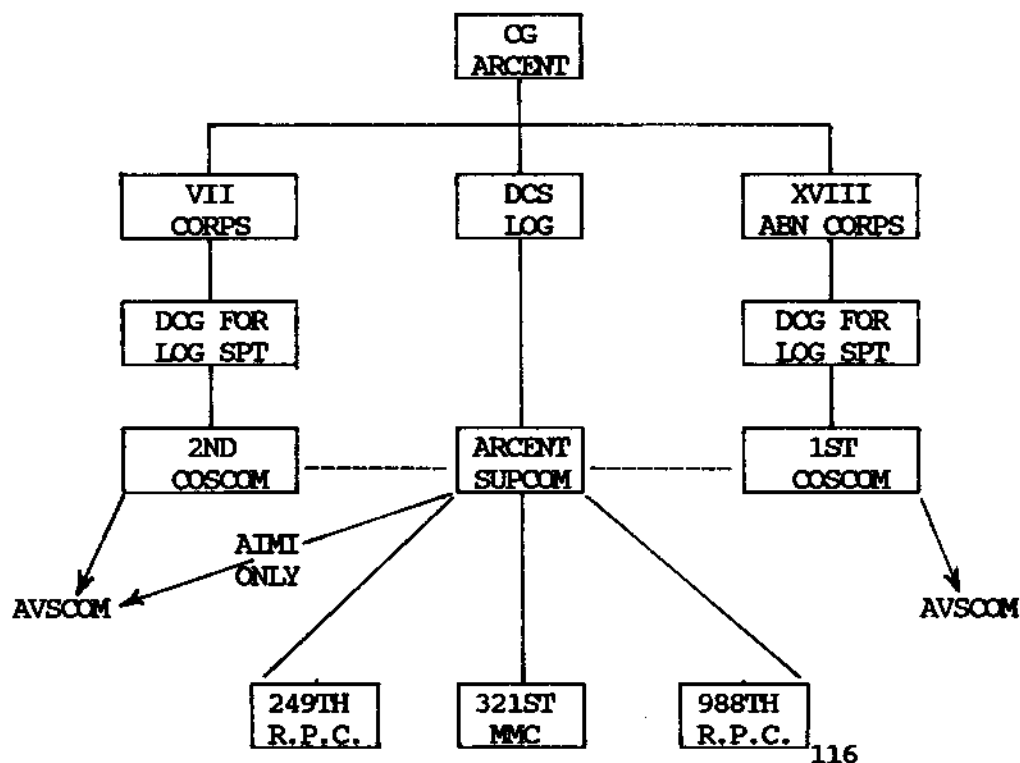
AIMI Flow



Other Requisitions Flow



After the deployment of the VII Corps, an organization which mirrored that of the XVIII Corps arose:



The above chart had, with the addition of the VII Corps, three request lines headed towards the AVSCOM, as shown. It also was an aviation chart. Attached to the ARCENT SUPCOM, for example, was an Army Support Group; it handled all non-aviation requisitions. Army aviation was, then, as in Vietnam, the subject of special treatment. The AVSCOM, as noted, had by far the largest AMC contingent in the zone of operations, a status it would maintain throughout the months-long danger period.

¹¹⁶Discussions, LTC Thomas Prickett, Officer in Charge, 1st Shift, AVSCOM-L-EOC, with Howard K. Butler, 27 and 28 February 1991.

AVSCOM Substance

TAMP-FORWARD

Despite, again to reiterate, the neat organizational boxes, the reality was more catch-as-catch can. An example might serve to illustrate this point:

By 5 September 1990, 24 days after the first AVSCOM personnel disembarked, the AVSCOM already had 69 workers in the zone of operations. Thirteen of these were military or Department of the Army Civilians (DACs), stationed as so:

<u>Number</u>	<u>Unit</u>	<u>Location</u>
4 ¹	TAMP-SA	Dhahran
3 ²	101st AVN	King Fahd AB ³
2 ²	82nd AEN	Dhahran
3 ²	24th ID	King Fahd AB
1 ²	2/229th ⁴	

¹1 Officer, 1 Warrant Officer (WO) and 2 Noncommissioned Officers (NCOs)

²DACs

³Air Base

⁴For example, the 2nd Battalion of the 229th Regiment

The 69 noted divided thusly:

<u>Category</u>	<u>Numbers</u>
LARS	9
CFSRs	24
CFT	17
BASI	10
MM ¹	3
GE ²	2
SIPI	0
BELL	0
MDHC ³	0
Military	<u>4</u>
Total	69

¹Martin-Marietta

²General Electric

³McDonnell Douglas Helicopter Company¹¹⁷

The 4-man Dhahran core of the AVSCOM presence in Saudi Arabia was but, as an early discussion indicated, one-half of the TAMP-SA, TAMP-Forward. The time was now at hand for TAMP-Base to form.

TAMP-BASE

All the while the EOC was in full-scale operation, the AVSCOM Directorate for Maintenance's counterpart, the Maintenance Operations Center (MOC), was

¹¹⁷AVSCOM-L-EOC, Personnel Status - Deployed (5 Sep 90).

running with a full head of steam. Parts may have become the commander's passion, but someone had to be in the theater who would know what to do with them. Maintenance had two choices: LTC Roy Oler, Chief, Depot Operations Division, and a key planner, or Captain (CPT) Michael A. Powell, an MOC member who had great knowledge of, and steady participation in, all of the relevant proceedings. As LTC Oler, who would succeed LTC Beahon at TAMP-Forward in November, could not then be spared, CPT Powell found himself, in the first week of September, aboard an aeroplane bound for the gulf.

His destination was Abu Dhabi. Originally, the AVSCOM had considered Jeddah, on the Red Sea, as an alternative; its strong suits were its relatively same distance from Dhahran as Abu Dhabi - both were out of SCUD range - and its same country as Dhahran status. Abu Dhabi, however, had far better repair and storage facilities, and so it became the captain's terminus.¹¹⁸

Abu Dhabi was Denver to Dhahran's trailer park in Sierra Vista. Captain Powell would stay in the Sheraton, ride a taxicab to work, and, if he wanted a telephone, he had one. The contractor in Abu Dhabi, the Gulf Air Maintenance Company (GAMCO), had been in place for several years, and it had successfully

¹¹⁸The facilities included a large aircraft maintenance complex which the AVSCOM could foresee, already by 26 August 1990, of housing various SRAs to include ones for the TADS/PNVS and the MMS, as well as an activated AVCRAD: See: 1) MSG, AMSAV-L-EOC, to the Commander-in-Chief, FORSCOM, 26 August 1990, subject: Activation of One National Guard Aviation Classification and Repair Depot (AVCRAD). A Materiel Readiness Support Survey (MRSA) site survey at Abu Dhabi, which concluded on 26 September 1990, recommended that, in addition, an Army Oil Analysis Program (AOAP) Laboratory be located at Abu Dhabi, as well: 2) MSG, AMSAV-L-EOC, to the AMCOC-RE, 26 September 1990, subject: SITREP (sic).

established itself as a general commercial maintenance repair facility, particularly for large jet engines. Under a management firm known as Johnson Controls, the GAMCO had collected a large work force, had brought special tools, and had erected several facilities, including a hangar large enough - 20,000 square feet - to hold two or three Boeing 737s at once.

The GAMCO had the size and the strength, but not the proper focus. The Army was not flying 737s; the GAMCO lacked the experience with small jet engines and the pertinent tools and technical publications to effect repairs upon such engines. Captain Powell realized that to meet the AVSCOM's shorten-the-pipeline mission for Abu Dhabi, some months would elapse. Hopefully, by early 1991, the Abu Dhabi operation would be a true depot in country, stocking backup supplies, making complicated repairs, and offering special logistical services, such as the operation of various Special Repair Activities (SRAs). For the first two weeks, though, CPT Powell and five Johnson Controls employees assessed capabilities, unearthed deficiencies, and made corrective action plans.

From the last week of September until CPT Powell departed on December 7, 1990, the Abu Dhabi operation, or TAMP-Base, took much of its desired form. For the first 60 days, direct flights brought in parts and tools; other AVSCOM elements, such as Procurement and Production, Product Assurance, and Engineering, sent representatives; a CCAD team arrived to train GAMCO personnel in repairs; and special equipment, such as the Modular Engine Test Stand (METS), arrived. The most acute difficulties were manuals, for some of which TAMP-Base sent a man to Dhahran to get; a lack of computer responsiveness and a plethora of staffing on the part of some AVSCOM elements, particularly Materiel

Management, to the TAMP-Base's manual effort to identify critical components and get a bench stock to do engine repairs, instead of that directorate simply identifying, for example, the top 500 required components to ship to Abu Dhabi; the local bureaucracy which, as in Dhahran, wanted all the "t"s crossed - over and over again; a misuse of requisition priorities by units; and transportation, which, because of shifting priorities and feet-dragging by the Logistics Clearance Authority (LCA) and certain Depot Systems Command (DESCOM) elements, became hopelessly snarled in December of 1990 and never recovered.

Captain Powell left on the 7th of that month for Dhahran. By that time, the TAMP-Base was doing T-55 engine repairs, and some work on the T-700 engine; the warehouse was fully automated and functional; and about 60 percent of General Williamson's goal of 100,000 parts for battlefield spares was on hand, an objective that the TAMP-Base had met by closing the doors on all but Aircraft-on-the-Ground requisitions. About 45 people staffed the facility. By the end of the war, 27 February 1991, TAMP-Base had over 122,000 parts on hand, with about 90 percent of the categories satisfactorily stocked.

TAMP-KKMC

After a month in Dhahran as LTC Oler's Executive Officer, CPT Powell again became a point man, this time to King Khalid Military City (KKMC). As the VII Corps debouched into the arid vastness of northern Saudi Arabia, it quickly moved out of the already not-so-easy reach of the TAMP-Forward and Dhahran. An answer to this outstretch was another TAMP-Forward, or, officially, TAMP-KKMC. In mid-January 1991, subsequent to two scouting forays earlier that month, CPT Powell returned to KKMC to become, as he had in Abu Dhabi, the lone man, and officer-in-charge, of TAMP-KKMC.

Captain Powell's mission was to develop a Repairables Exchange (RX) point, at which a unit could receive a working part in return for one that could be repaired. This was doubly important to one of the brigades deploying; as an echelons above corps (EAC) unit, it did not have an Aviation Intermediate Maintenance (AVIM) capability. Approximately a dozen Dyncorp contractor personnel came to KKM to essay that EAC work, to be joined by a 5-man SIPI team under a noncommissioned officer (NCO) to do the RX chores. Clamshells, trailers, and assorted trucks, to include, with trailers, 40-foot long models, followed, as well as more people, and, by the end of February, there were about 40 on hand, including COL Gary Johnson, AVSCOM Director for Maintenance, who assumed command of the TAMP-KKMC.

The 4-day ground war ended before the TAMP-KKMC's expansion concluded. On 5 March 1991, when CPT Powell returned to America, 43 of the 120-odd numbers of the Connecticut National Guard's Aviation Classification and Repair Depot (AVCRAD), one of four such Army units, were to deploy to the TAMP-KKMC. Counting these and the 20 members of a platoon of the 988th Repair Parts Company, the TAMP-KKMC would have about 100 people on site by mid-March of 1991.

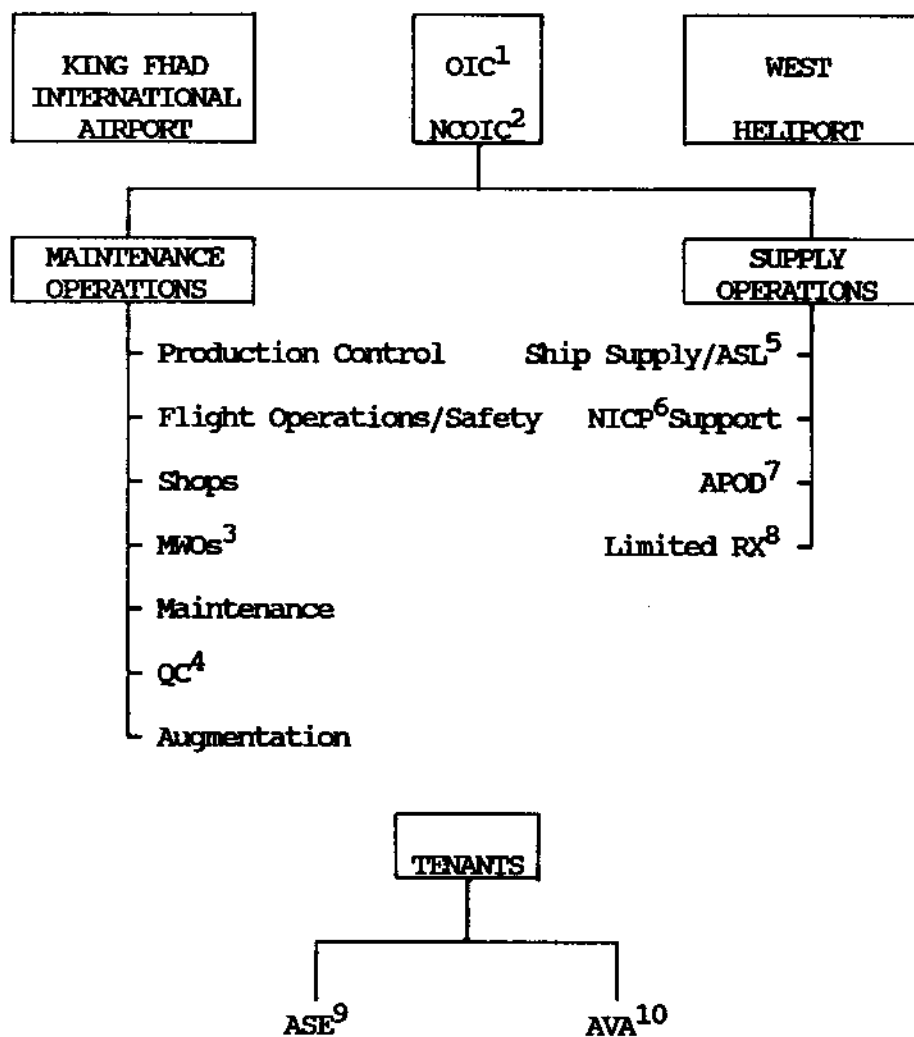
The TAMP-KKMC was the last institutional enlargement of the AVSCOM in Southwest Asia. Thankfully, the abbreviated war halted further stations. There would be no TAMP-Baghdad.¹¹⁹

The AVSCOM in SWA - A Review on Charts

The TAMP-SA had, therefore, tripled in the number of chart blocks from August 1990 to January 1991. It now consisted of aviation support facilities at Dhahran, Abu Dhabi, and KKM, which appeared so:

¹¹⁹Interview, Howard K. Butler with CPT Michael A. Powell, 14-15 March 1991.

Dhahran Aviation Support Facility



¹Officer in Charge

²Noncommissioned Officer in Charge

³Modification Work Orders

⁴Quality Control

⁵Authorized Stockage List

⁶National Inventory Control Point

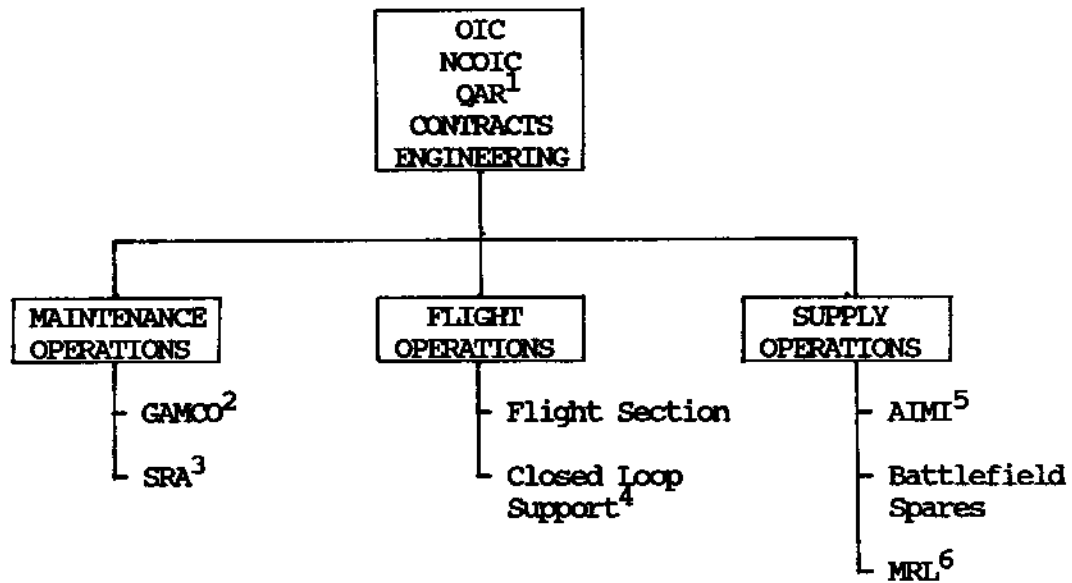
⁷Aerial Port of Debarkation

⁸Repairable Exchange

⁹Aircraft Survivability Equipment

¹⁰Aircraft Vibration Analyzer

Abu Dhabi Aviation Support Facility



¹Quality Assurance Representative

²Gulf Air Maintenance Company

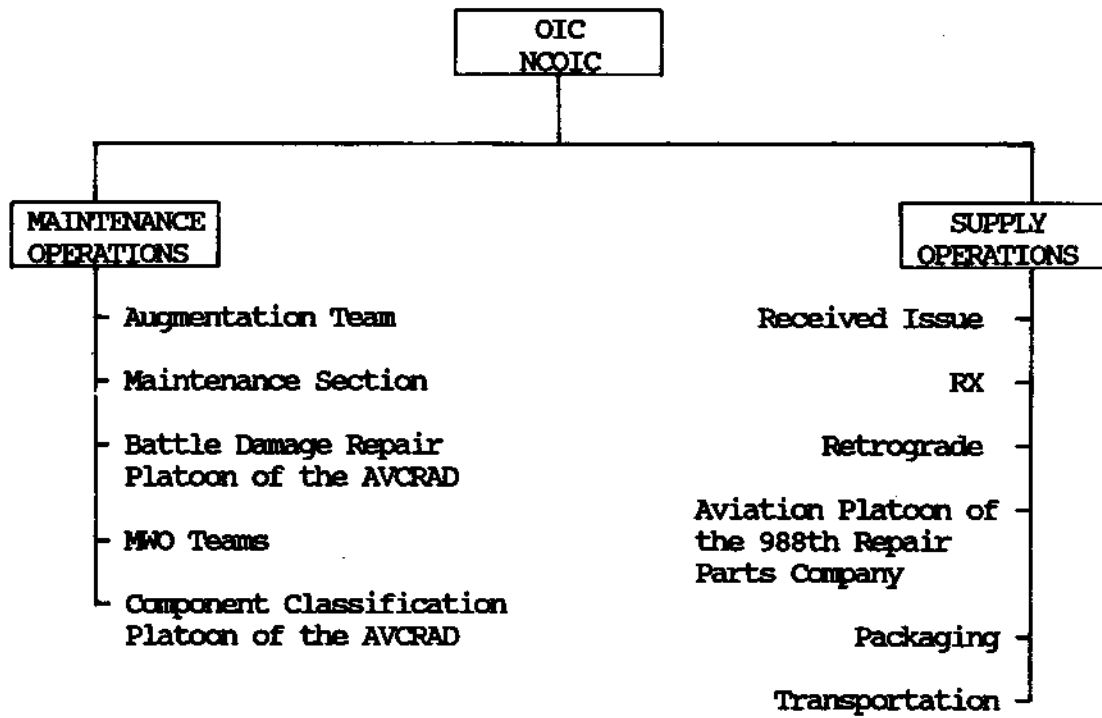
³Special Repair Activity

⁴That was, contractor support of particular aircraft.

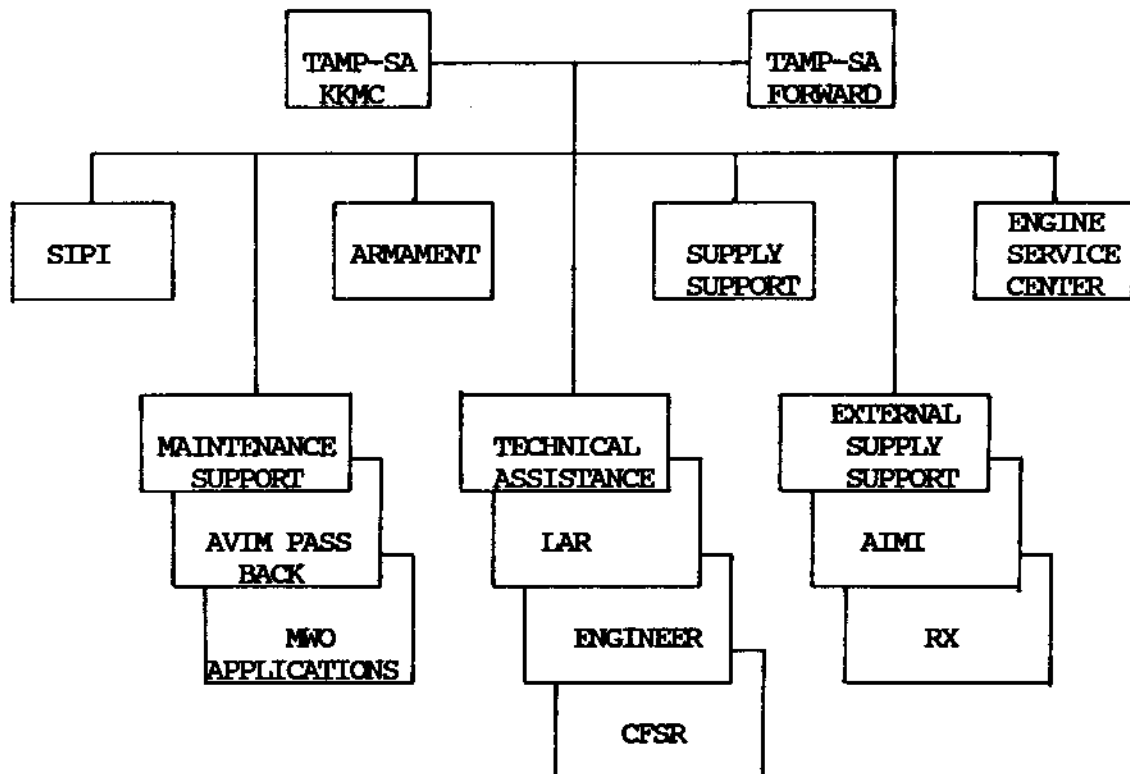
⁵Aviation Intensively Managed Items

⁶Material Requirements List

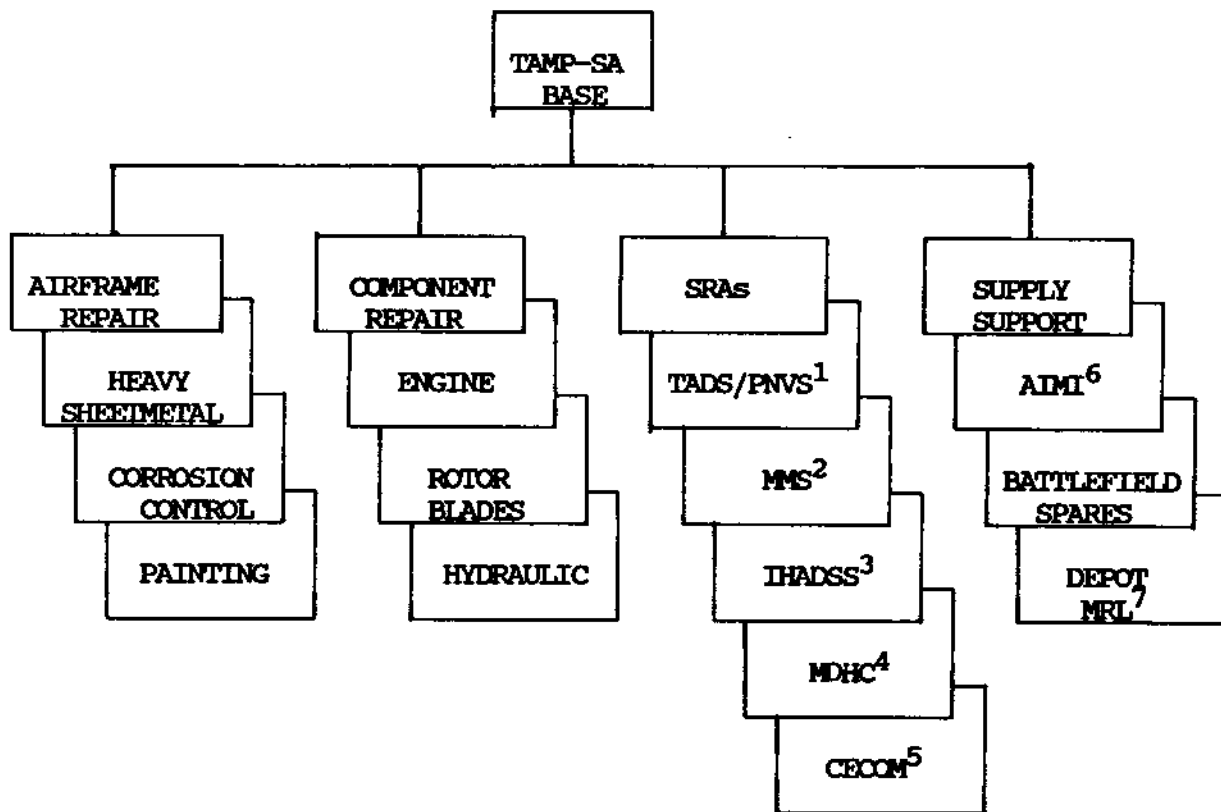
KKMC Aviation Support Activity



The Dhahran and KKMC operations or, more properly, TAMP-SA Forward, and TAMP-KKMC, respectively, had the same basic support functions, viz.:



Abu Dhabi had much more extensive maintenance and supply tasks¹²⁰ than the other two activities:



¹Target Acquisition Designation System/Pilot Night Vision Sensor

²Mast Mounted Sight

³Integrated Helmet and Display Sighting System

⁴McDonnell Douglas Helicopter Company

⁵Communications-Electronics Command

⁶Aviation Intensively Managed Items

⁷Material Requirements List

¹²⁰Per the findings of a Materiel Readiness Site Survey Team: MSG, AMCOC-RE to the DALO-LOC, 26 September 1990, subject: AMC SITREP No. 42.

Within and without the preceding administrative blocks, COL Johnson, the aforementioned Director of Maintenance, AVSOM, who entered Southwest Asia in February, 1991, depended upon 12 key individuals for maintenance and materiel coordination. These were:

- Maintenance - MAJ Brooks
- Administrative Contracting Officer - MAJ Hancock
- Technical Support - Mr. Smith
- Maintenance Engineering - Mr. McDonald
- Supply - Mr. Hamblin
- NICP¹ Operations - SFC Upshure
- NICP Forward - Mr. Prichard
- NICP Rear - MAJ Burns
- Maintenance Operations - LTC Oler
- Maintenance Operations, KMC - CPT Powell
- Maintenance Operations, Forward - MW4² Jay Nance
- Maintenance Operations, Rear - CW4³ Robbie Cryer

¹National Inventory Control Point

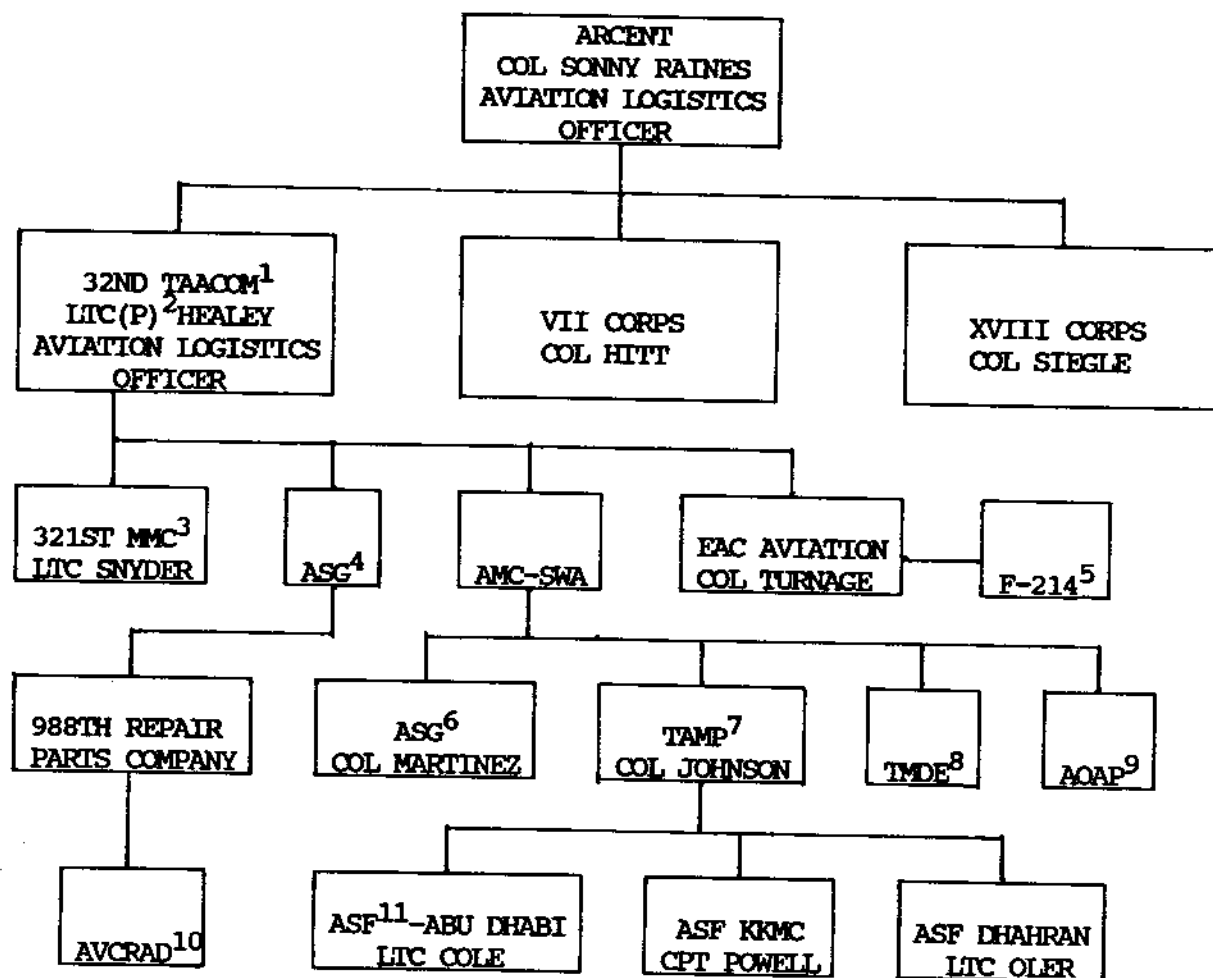
²Master Warrant Officer, Grade 4 - a new rank superior to CW4. There are no MW1s, 2s, or 3s.

³Chief Warrant Officer, Grade 4¹²¹

¹²¹Directorate for Maintenance, TAMP Charts, undated, collected by Howard K. Butler from the Maintenance Operations Center, March 15, 1991.

The position that these AVSCOM maintenance and supply enterprises occupied in the overall Army logistic scheme in Southwest Asia (SWA) can be seen as:

Key Aviation Logistics Positions in SWA



¹Theater Army Area Command

²LTC (Promotable), that was, approved to be a colonel.

³Material Management Center

⁴Area Support Group

⁵F Company of the 214th Aviation Regiment

⁶Army Support Group

⁷Theater Aviation Maintenance Program

⁸Test, Measurement and Diagnostic Program

⁹Army Oil Analysis Program

¹⁰Aviation Classification and Repair Depot

¹¹Aviation Support Facility¹²²

¹²²Directorate of Maintenance, Key Aviation Logistics Position Chart, circa March 15, 1991.

Southwest Asian Operations: 2 August 1990 - 30 September 1990

Introduction

Reminding the reader that the preceding charts represented an organization that required six months to evolve and flesh out, and that, as the combat troops deplaned, there were virtually no maintenance and supply capabilities at hand, then taking into account the demands of modern aviation logistics, there would soon arise a series of exigencies that the hot, sandy environment would only exacerbate. The AVSCOM, as indicated, acted to short circuit such crises before they occurred, chiefly by flooding SWA with contractors, greatly increasing, or "surging," production, and establishing teams to deal with particularly pressing problems with major articles of equipment. Examples of each, in turn, were, one, contractors

- the 24 August 1990 successful conclusion of negotiations with Pan Am World Services, Incorporated, for services and facilities at Abu Dhabi;

- the 24 August 1990 modification of the Sikorsky International Products, Incorporated (SIPI) contract to allow support not to exceed nine months, at a cost of \$9,954,000, for the just-established forward base at Dhahran, with \$3,200,000 obligated on 14 September 1990;

- the 29 August 1990 deployment of 11 contractors to the theatre to effect Project Code OLR, the application of back-logged Modification Work Orders (MWOs) to Army aircraft, to be followed by a second set of 11 on 7 September 1990;

- the 3 September 1990 movement of the TADS/PNVS SRA from Pope Air Force Base, North Carolina, to Abu Dhabi, the first such SRA to undergo movement to SWA;

- and the 8 September 1990 initiation of planning to establish a McDonnell Douglas Helicopter Company (MDHC) SRA at Abu Dhabi;

. two, "surges":

- the 14 August 1990 commencement of MWO kits for deploying aircraft;

- the 16 August 1990 provision, by Materiel Management, for all surge requirements for Phase I, the expedition of Fiscal Year (FY) 1990 and FY91 requirements, to be followed by Phase II, the generation of components to meet the additional SWA demands, with parts, if necessary, to be pulled from production lines;

- and, the 16 August 1990 initiation of daily accounting for "war stoppers," or those items without which aerial operations in SWA would halt, and the subsequent 31 August 1990 dispatch of a "war stoppers" MWOs list to ARCENT with a plan for application of these MWOs;¹²³

. and three, teams:

- which, already by 25 August 1990, were no less than a dozen in number, being the AH-64, the UH-60, the T-700/701 engine, the UH-1, the AH-1, the OV-1, the T-53 engine, the CH-47D, the T-55 engine, the OH-58 Light Observation Helicopter (LOH), the OH-58D, and the TADS/PNVS. All of the teams met weekly.¹²⁴

¹²³Memo, COL Ramon A. Ivey, Director of Readiness, AVSCOM, for the Commanding General, AVSCOM, 21 September 1990, subject: AVSCOM Desert Shield Daily Update.

¹²⁴Directorate for Readiness, AVSCOM, Desert Shield Supply Support Team Analysis, 25 August 1990.

The "team" could be quite large in size. The AH-64, or Team Apache, for instance, handled over 50 items and was more than 100 strong.¹²⁵ The size was due to the use of system experts from various command elements, such as maintenance, materiel management, resource management, engineering, procurement and production, product assurance, legal, and the appropriate project or product manager (PM).

Much of the difficulties faced by aviation logistics in SWA could, as both stated and suggested earlier in the text, be found at the door of a house called neglect. "Make-dos" and delayed repairs had made Army aviation increasingly logistically unprepared in the '80s for even day-to-day operations. When the Southwestern Asian affair began, Army aviation should, ideally, have received at least two months notice to get ready. This space would not have eliminated the age problem, but repairs could have been made, with factories, facilities, and contractors either on hand or nearby. The deployment of marginally fit equipment proved costly in transportation, travel, and transplantation; to draw a comparison, it is good form to have one's automobile overhauled before one ventures upon a long journey.

Recognition of this came from the deployed units themselves. Writing on 21 November 1990, the 101st Airborne Division (Air Assault) made several notes on said score

¹²⁵Marilyn Ulrich, AVSCOM Public Affairs Office, "Apache Helicopters Fired First Shots of War," The Gateway Reporter, Volume 14, Number 6, April 3, 1991, p. 1.

" Age main problem, particularly age of engines. Marginal engines at Campbell, not enough power in SWA
 Repairs instead of replacement
 on-site repair capacity at (Fort Campbell) . .
 . . restored usage without complete repair . .
 . . (and, tellingly, we) saved \$5 million over two years "but it is now leading to a few engine problems. Currently four aircraft are undergoing either engine change or depot level repairs at TAMP Forward. There are eight aircraft NMC (Not Mission Capable), all maintenance."¹²⁶

The AVSCOM - Action and Reaction

Recalling our automotive analogy, the travelers to Southwest Asia began to have over-heated engines, loose bolts, and clogged air cleaners. As early as 17 August, the AVSCOM Emergency Operations Center received 388 requisitions, 80.8 percent of which the command filled on the "first pass," and it had

¹²⁶Memo, AMC-SWA, for the Deputy Chief of Staff (DCS) for Readiness, HQ, AMC, 21 November 1990, subject: SITREP #92, 21 November 1990.

already identified airframe and engine "war stoppers."¹²⁷ From the onset, the AVSCOM did not merely wait for reports of woes; it attempted even in those last eight weeks of FY90, to forestall them with a deluge of parts, procedures, and personnel. Some notions of the olio in the last days of FY90 - anticipation, requests, and responses - were:

- sea shipment of aircraft - aircraft protection, aircraft restrictions, cranes for loading and unloading,¹²⁸ and special CCAD manufactured "spreader" bars to hoist CH-47s;¹²⁹

- Test, Measurement, and Diagnostic Equipment (TMDE) Calibration - the necessity to transfer the closed loop support (CLS) for such gear, that was, support by the manufacturer to maintain his equipment, from the United States to SWA;¹³⁰

¹²⁷MSG, AVSCOM-L-EOC, to the AMCOC-RE, 17 August 1990, subject: Operation Desert Shield.

¹²⁸MSG, CDR, XVIII Airborne Corps, Fort McPherson, Georgia, et alia, 16 August 1990, subject: Aircraft Experience at SPOD (Seaport of Debarkation).

¹²⁹Editor (Ed.), "Slings for 'Desert Shield'," Gateway Reporter, Vol. 13, No. 17, September 19, 1990, p. 1.

¹³⁰CDR, Information Signal Command, Redstone Arsenal, Alabama, to the AMSAV-L-EOC, 21 August 1990, subject: Calibration Capabilities for In-Country Aviation TMDE.

- an extension of range for 13 of the 18 UH-60s of the 24th Infantry Division (Mechanized), which did not have such range, in order that the unit, initially stationed approximately 180 miles from Dhahran, could negotiate the vast distances involved in the daily conduct of its business.¹³¹

- the production, test, and dispatch of heat and dust protection covers for helicopter-mounted Hellfire Missiles, Tube-Launched, Optically-Tracked, Wire-Guided (TOW) Missiles, and 2.75 inch rockets;¹³²

- the expedition of very basic materials - not really an AVSCOM-assigned task - to deploying units, such as tie-down anchors and canopy covers to the 101st;¹³³

- the adumbration of a plan to replace all of 54 AH-1E Cobras in SWA which some bonehead had ordered deployed there, despite their lack of ASE and appropriate desert filters, with AH-1Fs.¹³⁴

- the expedition and expansion of the clamshell hangar actions;¹³⁵

¹³¹MSG, CDR, 24th Infantry Division, Fort Stewart, Georgia, to the AMSAV-L-EOC, 26 August 1990, subject: Extended Range Requirement for 24th INF DIV(M) UH-60 Aircraft.

¹³²MSG, AMCOC-RE, to the DALO-IC, 6 September 1990, subject: AMC SITREP No.22.

¹³³MSG, CDR, AVSCOM, to the CDR, 1st Cavalry Division, 31 August 1990, subject: Request for Assistance.

¹³⁴AVSCOM Aviation Activity Notes, circa 10 September 1990.

¹³⁵MSG, AMSAV-L-EOC, to the AMCOC-RE, 21 September 1990, subject: SITREP (sic).

- the provision of instructions to SWA units for the disposition of crash-damaged aircraft, said tutelage incident to an OH-58D crash;¹³⁶
- the arrangement for Beech Aerospace Services, International, to maintain the C-12s and U-21s in Saudi Arabia;¹³⁷
- the publication of revised gas turbine engine cleaning procedures to account for the SWA setting;¹³⁸
- the initiation of steps to extend the grasp of the MDHC's MMC SRA capability at Abu Dhabi to embrace the electronic heart of the Apache, the Fire Control Computer;¹³⁹
- the expedition of both equipment dispatches and contract awards for Non-Standard Items (NSIs);¹⁴⁰
- and, to fund such steps as those just noted, repeated requests to the AMC for emergency funds, such as a 2 September 1990 call for \$600,000 for transportation.¹⁴¹

¹³⁶MSG, AMSAV-L-EOC, to the CDR, AMC, Adelphi, Maryland, 23 September 1990, subject: STIREP No. 45.

¹³⁷MSG, AMSAV-L-EOC, to the COMUSARCENT SUPCOM (PROV), circa 29 September 1990, subject: Information Update No. 15.

¹³⁸MSG, AMSAV-L-EOC, to the AMOCC-RE, et alia, 30 September 1990, subject: STIREP (sic).

¹³⁹MSG, CDR, Missile Command (MICOM), to the AMSAV-L-EOC, 14 September 1990, subject: Operational Desert Shield Potential Enhancement of In-Country Special Repair Activity (SRA).

¹⁴⁰MSG, Directorate for International Logistics, HQ, AVSCOM, to the AMCDC, HQ, AMC, 5 September 1990, subject: Operation Desert Shield.

¹⁴¹CDR, AVSCOM, to the AMC Resource Manager, 2 September 1990, subject: Emergency Request for FY90 Desert Shield Funding.

The AVSCOM - An Early Team Review

Actions over such a wide scope involved nearly all of the AVSCOM, from early August, in generally recognized major processes - maintenance augmentation, MWOs, rapid depot stocking, or surges, and so forth.¹⁴² Since, however, these latest demands bore somewhat of an urgent character, the AVSCOM had, perforce, not only to cut through its own bureaucratic maze within which its affected segments normally interacted to meet the operational requirements in Arabia, but it also had to request, and secure by implicit promises, a lets-not-get-bogged-down-by-the-rules approach from its prime contractors.¹⁴³

The Commander personally wielded the hedge-clippers. At the daily Desert Shield Conference of Wednesday, September the 26th, 1990, for instance, he discovered that his promise of a 72-hour response to urgent requirements rang-in from Saudi Arabia had been interpreted by his Materiel Management arm as 72 hours from request to the "cut" of a Materiel Release Order (MRO) to a supply depot. Not so, the general interjected; his 72 hours were from receipt of the request to deposit in the sand; already irate, he continued: "Don't sit on your as_ and give me bureaucratic" ¹⁴⁴

¹⁴²Memo, LTC Thomas R. Prickett, Officer-in-Charge, AMSAV-L-EOC, for the Director of Readiness, AMC, 14 August 1990, subject: Aviation Support Actions(AVSCOM) SITREP (sic).

¹⁴³Editor, "All in Army Community Vitally Involved in 'Desert Shield'." Gateway Reporter, Volume 13, No. 17, September 19, 1990, pp. 1, 3, 8.

¹⁴⁴Historian, NDSC, 26 September 1990.

The AVSCOM - An Assessment

In no small measure due to such prodding, the AVSCOM recorded an impressive list of across-the-command achievements in those last two months of FY 1990, as the following sampling would indicate:

- Readiness - the conduct of weekly UH-60, UH-1, and OH-58D meetings, activation of the Emergency Operations Center as an around-the-clock focal point for in-bound requests from the sands, and the dispatch of Logistics Assistance Representatives to that sphere;

- Materiel Management - the addressment of daily emergencies to satisfy spares requirements, the pre-position of parts for critical aircraft components, and the activation of a World Wide Military Command and Control System, the obligations of all the \$395.7 million for Aircraft Procurement Army Secondary, of \$53.3 million for sundry exigencies, and of \$53.1 million to buy T-700 and T-701 engines, and a buy back of 60 T55-L-712 engines from the production line;

- Maintenance - the dispatch of a Logbook Automation System to provide aviation units with a completely automated method for tracking aircraft maintenance, the implementation of a Special Repair Activity for Apache mission equipment, and the expenditures of countless man-hours and equipment in support of such items as the CH-47 Engine Air Particle Separator and the development of plans for the establishment of the Theater Aviation Maintenance Program - Saudi Arabia site;

- Procurement and Production - the execution of 3,141 Maintenance and Overhaul (M&O) contract-related actions for Southwestern Asian operations;

- Communications Intelligence/Electronic Warfare - all aircraft in this category - RC-12s, RU-21s, and EH-60s - either underwent deployment to the

desert or were the subjects of deployment studies. The EH-60, in particular, required the development of a float plan, the provision of arrangements for Contractor Logistics Support for its Mission Equipment Package, the development and procurement of a Direction Finding Kit and an Extended Range Fuel System, and the installation of an AN/ALQ-162(V)2 warning jammer set.

- Aviation Life Support Equipment - the acceleration of procurement for both the M43 Aircrew Chemical Protective Mask and laser protected eyeglasses for use with HGU-56P and the AH-6U Integrated Helmet and Display Lighting System Flight Helmets;

- UH-1 - the provision of Saudi Arabian-bound UH-1s with improved particle separators, aircraft survivability equipment, ANVIS VI combat lighting, and radar altimeters;

- Air-to-Air Stinger (ATAS) - the acceleration of seven of the tactical unit fieldings to meet Desert Shield needs, with nine so-equipped units deploying to Southwestern Asia in FY90;

- International Logistics - the dispatch of the Saudi Arabian Program Manager to Dhahran, Saudi Arabia, to act as the first AVSCOM Forward and the modification of a Saudi Arabian Foreign Military Sales maintenance support contract for Army use;

- Research, Development, and Engineering Center - the shipment of L-100 paint and rotor blade leading edge tape to improve abrasion resistance to the fine desert sand;

- Aviation Applied Technology Directorate - the fabrication of Interim Unit Maintenance Aerial Recovery Kits and the shipment of the just-completed Divisional Aviation Intermediate Shop Set mounted on nine, one-sided expandable shelters and equipped with the latest tools;

- Engineering - the development of a Black Hawk Auxiliary Power Unit Particle Separator, qualification of the OH-58C Stinger Missile System, and the identification and acquisition of tie-down and mooring devices for helicopters;

- Civilian Personnel Office - the successful negotiation of 143 Desert Shield civilian "buy back" spaces just after the initiation of a major Reduction-in-Force;

- Safety Office - the extensive use of its direct computer link with the Army safety data base;

- Legal Office - the offering of assistance to departing soldiers and civilians, and the settlement of some legal issues for the convenience of the latter;

- Resource Management - the expenditure of \$8.221 million in Base Level Commercial Equipment funds, \$20 million in Army Stock Funds, and \$371,298.10 in FY89 Research, Development, Test and Evaluation Funds for Desert Shield;

- Information Management - the installation of coaxial cable, terminals, terminal printers, and telephones in the Emergency Operations Center;

- Fielded Aviation Office - the dispatch of a battalion of old Army war horses, OV-1s, to Saudi Arabia to provide surveillance;

- Aviation Ground Support Equipment - the satisfaction of 13 urgent support requirements, the deployment of the Aviation Vibration Analyzer, the Divisional Shop Set Complex, and the Non-Divisional (Aviation Intermediate) Shop Set;

- and, Target Acquisition Designation Sight/Pilot Night Vision Sensor
- the expedition of a contingency filter to prevent crew injuries and of an optical improvement program wiring change, the calibration of electro-optical benches, the installation of Air-to-Air Stingers on three aircraft, and the dispatch of personnel to Saudi Arabia.

As the examples above suggest, the AVSCOM contributions during the first period had two prominent characteristics. One, they came from throughout the command and, two, many of them were a team endeavour.¹⁴⁵

The commanders in the field were not unaware of the AVSCOM's labors. On 15 October 1990, the Commander, 101st Airborne Division (Air Assault), noted that "Sustainment support (was) superb . . .," that the " . . . (repair parts) call-in system to (the) AVSCOM has been helpful and the response excellent," and that the maintenance shelters - clamshells - were " . . . valuable . . ." The general's praises were all the more remarkable as they came from within a text which spoke of " . . . sand and dust . . ." which led to engine and blade maintenance actions ten times (the) CONUS (Continental United States) rate"¹⁴⁶

¹⁴⁵AVSCOM Annual Historical Review, FY90, pp.6-8.

¹⁴⁶MSG, Commander, 101st Abn Div (AASLT), Camp Eagle II, to the CDR, AVSCOM, et alia, circa 16 October 1990, subject: (Operation Desert Shield.)

Southwest Asia Operations

1 October 1990 to 15 November 1990

The Parts Game

The AVSCOM Commander's preoccupation with parts could find its foundations in reports from the zone of operations

"3. As the number of ARCENT aircraft in Saudi Arabia nears 600, experience indicates (that) the harsh desert environment significantly increases aviation Class IX (Repair Parts) requests Certain aircraft components are experiencing abnormally high failure rates . . . Failures of exposed bearing assemblies, main rotor blade erosion, pitting of glass and acrylic wind screens and engine sand/direct ingestion are examples(of this)."147

Coupled with concerns about special items or equipment, such as the Global Positioning System (GPS)¹⁴⁸ and protective flyers' goggles,¹⁴⁹ the AVSCOM argued that it should be able to get parts at five times the peacetime rate - a

¹⁴⁷MSG, AMCOO-RE, to the AMSAV-L-EOC, et alia, 28 September 1990, subject: COMUSARCENT MAIN to USA CINOCENT Readiness, MacDill Air Force Base, Tampa, Florida.

¹⁴⁸MSG, AMCOO-RE, to the AMCLO-TMP, SITREP, 1 October 1990, subject: SITREP (sic).

¹⁴⁹1)MSG, AMSAV-L-EOC, to the AMCOO-RE, et alia, 4 September 1990, subject: SITREP (sic). 2) MSG, AMCOO-RE, to the DALO-AC, 29 September 1990, subject: AMC SITREP No. 45.

conservative estimate remembering the 101st's ten times experience. On 29 September 1990, the Commander, AVSCOM, discussed this matter, as well as flying hours, spares support, float aircraft, force structure, and transportation, with the Vice Chief of Staff, Army, and representatives of the rest of the "aviation community." He presented two propositions:

one, hold Desert Shield aircraft to 20 flying hours per month, use a 1.5 environmental factor, and hold the rest of the Army's air fleet to 10 flying hours per month;

two, fly more hours, but buy parts for SWA at a rate of 2.5 times the CONUS rates per flying hour and at an additional two times per flying hour in consideration of the environment - or five times per flying hour, in total. The VCSA approved the latter, as well as a 10 percent float and an aviation support structure concept for SWA.¹⁵⁰

The results from the DA were not entirely satisfactory: the HQ DA insisted, at this time, that Army aircraft maintain a 90 percent Mission Capable (MC) rate,¹⁵¹ or 15 percent more than the regular standard, and 10 percent above the yearend readiness rate in SWA:

¹⁵⁰MSG, AVSCOM-L-EOC, for the CDR, 1st COSCOM Forward, et alia, 1 October 1990, subject: (Operation Desert Shield.)

¹⁵¹Historian, NDSC, 9 October 1990.

<u>Type Aircraft</u>	<u>Number</u>	<u>MC</u>	<u>Percent MC</u>
AH-64A	108	92	85
UH-60	178	133	75
EH-60	9	7	78
OH-58C	119	98	82
OH-58D	43	36	84
CH-47D	49	41	84
AH-1	48	35	73
UH-1H	<u>50</u>	<u>40</u>	<u>80</u>
Total	604	482	80 ¹⁵²

The DA subsequently relaxed the SWA standard to 80 percent.¹⁵³

Perhaps the HQ DA yielded to stark reality. As FY90 began, the accumulation of aircraft and flying hours in Saudi Arabia - the units expected, and trained for intense combat - began to have devastating effects on aircraft in the zone of operations. On 30 September 1990, the Commander, XVIII Corps, reported to the Chief of Staff, Army (CSA), of widespread aircraft failings:

- CH-47s - 8 of the first 10 CH-47s showed substantial power losses after 35 hours, the compressor blades failed after 25 hours, and 16 of 82 engines were already defunct; 4 of the 16 had undergone change;

- AH-1s - engines stalled at 10 hours, degraded at 35, and failed at 50;

- and the UH-60 main rotor blade (MRB) became unserviceable at 25 hours.

¹⁵²FAX, DALO-AV, to the AVSCOM-L-EOC, 1 October 1990, subject: Summary Aircraft Status, 30 September 1990.

¹⁵³Historian, NDSC, 25 October 1990.

Other problems were pitted windshields, a lack of balancing machines and moorings, an inadequate number of Table of Organization and Equipment (TO&E) - authorized repairmen, misrouted pallets, and a heat so fierce that maintenance took place between 1:00 ante meridiem (a.m.) and 11:00 a.m. The commander's suggested remedies were the Enhanced Aircraft Particle Separator (EAPS) for the CH-47 and an Improved Particle Separator (IPS) for the AH-1S, windscreen covers, a 50 percent increase in numbers of his command with logistics Military Occupational Specialties (MOSs) 68C, 68D, 68G, 68F, and 67R, and, for balancing, the Rotor Analysis Diagnostic System - Advanced Technology (RADS-AT).¹⁵⁴

The most serious of all of the XVIII's problems, engine attrition, did not come to the notice of the AVSCOM commander until the sun started to slip behind the western horizon to conclude what would become a fateful Thursday, October the 18th, 1990. Just before the daily, and lengthy, Desert Shield Conference ground to its merciful close, an unguarded comment slipped out from an unwary participant at the big table - no engines in SWA lasted over 40 hours, and the average made only 25. Explosions from both the commander and his deputy speedily followed. Stripped of most of its profanity and condensed, the former's remarks stated that he ". . . did not want to be at the mercy of logistics the rest of my d____d career, O.K.?"

¹⁵⁴MSG, CDR, XVIII Airborne Corps (Forward), to the CSA, 30 September 1990, subject: Operation Desert Shield.

Preemption

The commander's anger arose from his oft-voiced desire to try to master at least the AVSCOM end of logistics, and not vice versa. Moreover, the commander's desire had taken expression just nine days earlier, with the publication of a lengthy briefing that called for an all-along-the-front attack on parts, to include:

- the reduction of items in "zero balance," that was, no stock on hand;
- the intensive management of "war stoppers," or critical items;
- the compression of deliveries prescribed in all active FY90 contracts;
- the preparation of over 5,000 new procurement actions;
- the "surge" of 1,200 depot programs;
- the initiation of 589 new depot programs;
- the addressment of delinquent contracts;
- the expedition of all 143 lines of AIMI to include stockage of the 132 lines required in the zone of operations;
- the preparation and dispatch of as-yet-unasked-for Authorized Stockage List/Prescribed Load List (ASL/PLL) packages;
- the formation of both spares recovery teams in the CONUS and a retrograde team in Saudi Arabia;
- and a 72-hour response to his new category of essential parts at the AVSCOM Aircraft-on-the-Ground, or AOG, that was, a part or parts without which an aircraft would not fly.¹⁵⁵

¹⁵⁵AOG surfaced at least as early as September the 28th, 1990: Historian, NDSC, 28 September 1990.

The commander estimated that his measures would cost \$1,088,000,000; since the Army Stock Fund for FY91 was \$595,000,000, this meant an extra \$493,000,000.

The October briefing touched the other two major AVSCOM concerns as well, that was, technical and materiel issues. The former embraced both procedures, such as the conduct of combat maintenance inspections for the OH-58D, the UH-60, the AH-64, and the CH-47; the adherence to a to-be-devised combat time-between-overhaul (TBO) criteria; and the pursuit of overall reliability improvements; and to specific items, such as filters, bearings, covers, engines, sling kits, windshields, blades (erosion), and the ballistic armor sub-system (BASS). The latter, materiel, also had comprehensive considerations, being MWOs for capability, safety, serviceability, and sustainability; specialities, such as clamshells; and various particulars in these two categories:

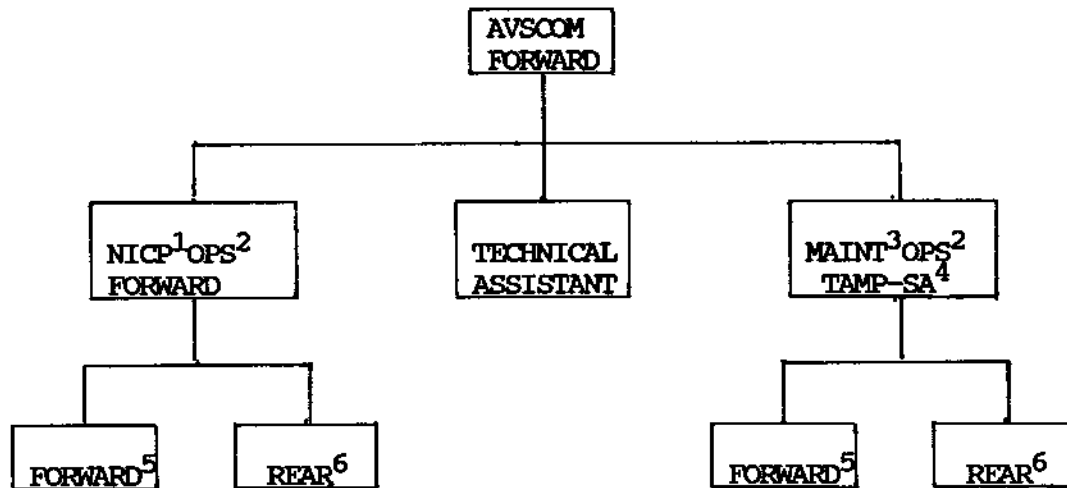
TMDE ¹	GSE ²
- Pitot Static Tester	- High Performance Hoist
- Aviation Vibration Analyzer	- Special Tools
- Vibrex	- Light Sets
- Breakout Boxes	- AGPUs ³
- Adjustment and Alignment Tools	- Tie Kits
- Nitrogen Cart	- Battle Damage Repair Kits

¹Test, Measurement and Diagnostic Equipment

²Ground Support Equipment

³Auxiliary Ground Power Units

To bring all of these initiatives into play, the AVSCOM already had a Theater Aviation Support Program (TAMP) erected in the zone of operations, viz.:



¹National Inventory Control Point

²Operations

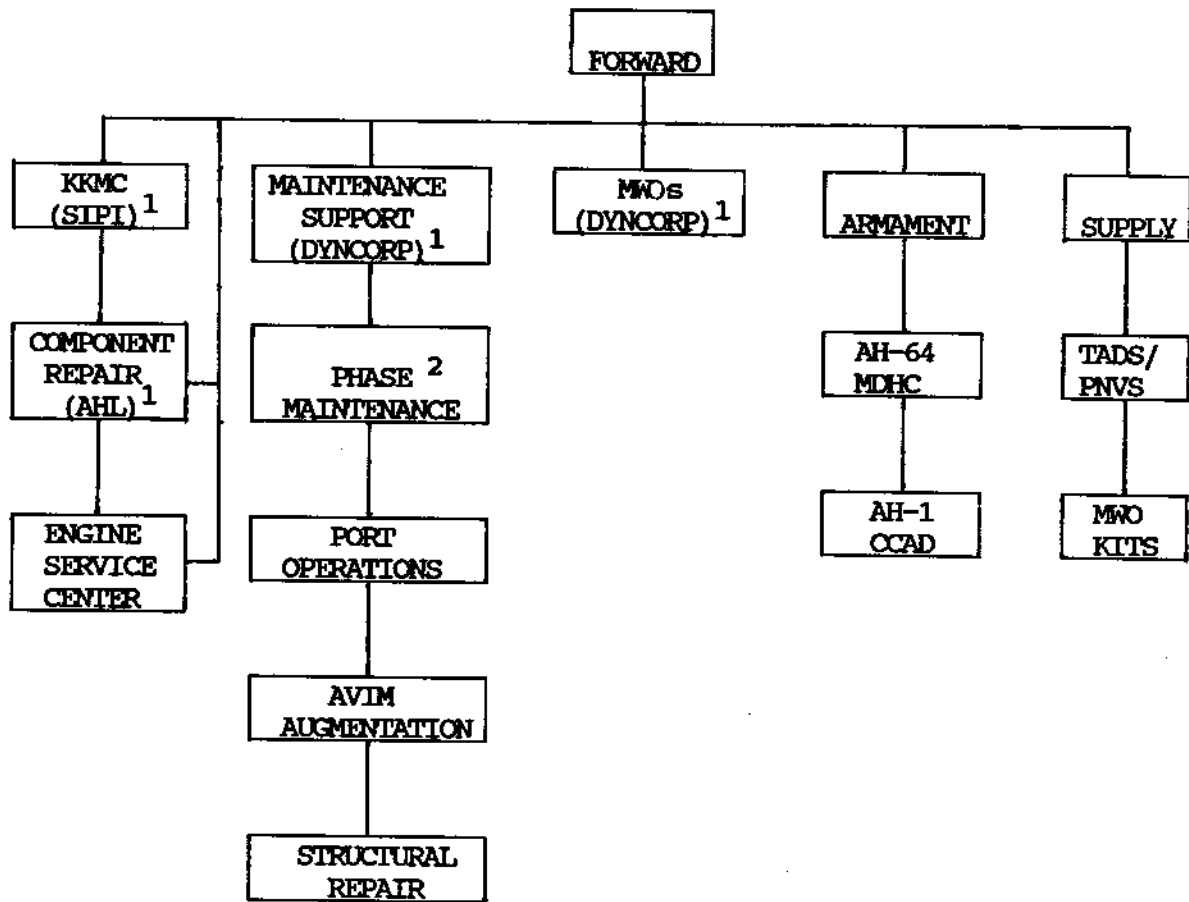
³Maintenance

⁴Saudi Arabia

⁵At Dhahran, Saudi Arabia

⁶At Abu Dhabi, Abu Dhabi, United Arab Emirates

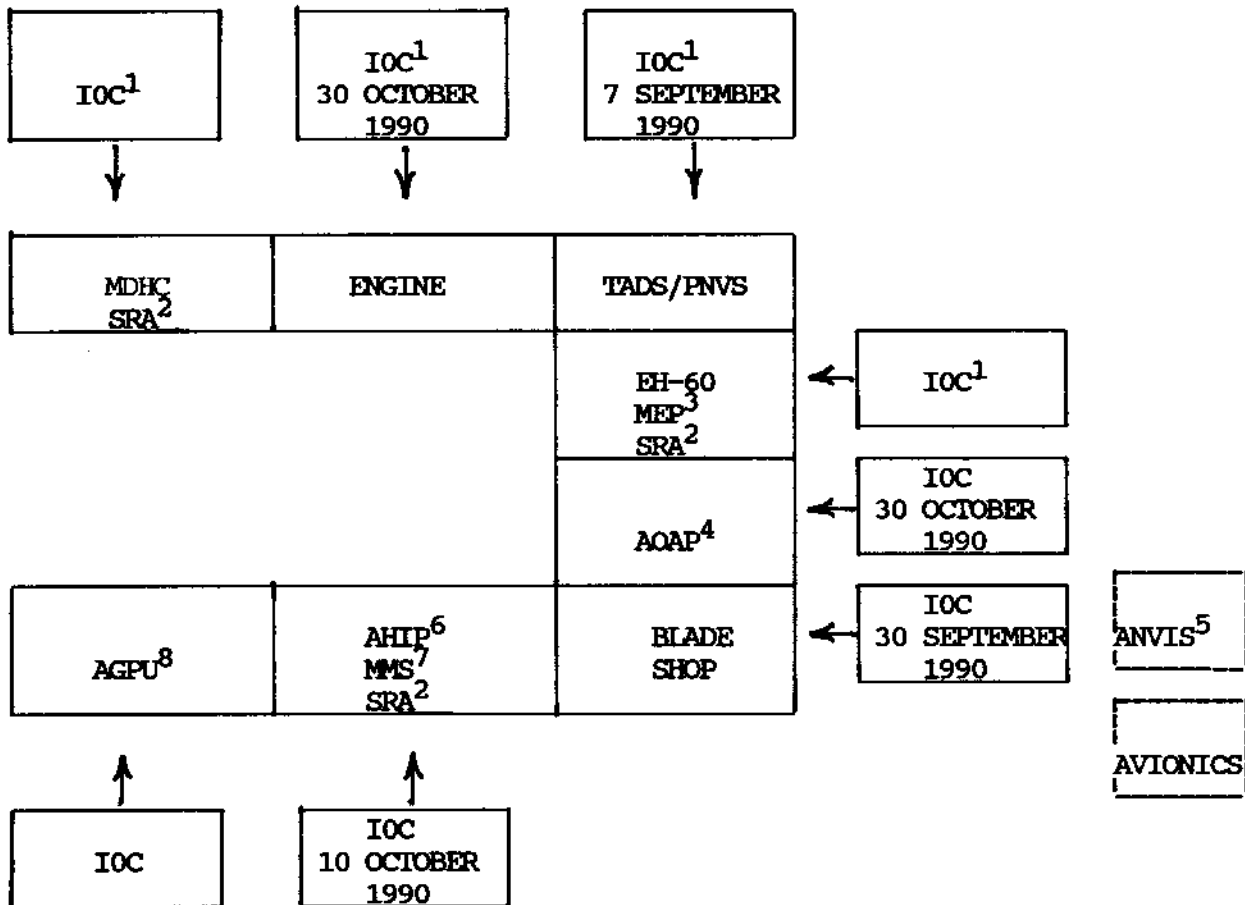
This TAMP-SA divided into two parts. One, the Forward at Dhahran, appeared thusly:



¹That were, contractors.

²That was, regularly scheduled maintenance.

The TAMP-SA Base in Abu Dhabi, shown below, was just beginning operations at this time:



¹Initial Operational Capability

²Special Repair Activity

³Mobile Electric Power

⁴Army Oil Analysis Program

⁵Aviator Night Vision Imaging System

⁶Army Helicopter Improvement Program, that was, the OH-58D Helicopter

⁷Mast Mounted Sight

⁸Auxiliary Ground Power Unit

As a reminder, the Gulf Air Maintenance Company (GAMCO), under a unit called Johnson Controls, operated the TAMP-SA Base at Abu Dhabi per a 24 August 1990 contract.

All of the above steps and structures would not be cheap. In addition to the \$493M for parts, the total monies which the AVSCOM said was necessary were:

<u>Categories</u>	<u>Amounts</u>
Parts	\$493,000,000
Contract Maintenance	79,000,000
Support Overhaul	271,000,000
Procurement, Major	49,900,000
Transportation	<u>2,300,000</u>
Total	\$895,200,000 ¹⁵⁶

Sand

The comprehensiveness suggested by the preceding charts had no small hold on actuality. The AVSCOM commander had, indeed, mobilized his command for total war in and over the desert, no matter what others might do. The desert, however, made certain counter demands on the AVSCOM and, verily, its sand had been, was, and would be, the most intractable, and challenging, foe of Army aviation. The sand's main targets were rotor blades, which churned through the fine, whirling grit, and engines, which sucked in the grains through its compressor blades with uncommon force. The results were constant erosion.

¹⁵⁶Briefing, HQ, AVSCOM, Desert Shield Aviation Logistics, 9 October 1990.

Given the no more than 40 hours an unprotected engine would have in action in such a state, one solution would have been to keep the rotary-winged fleet under wrap until the shooting started. The integral role of the helicopter in Army operational training forbade this course; the announced intent of the ARCENT was to train for a war of build-up, movement, and sustainment,¹⁵⁷ all of which needed the genus helicopters, with a particular emphasis on the lifting species Black Hawk.

There was no permanent measure for either the rotor blades or the engine. Interims had to do; for the former there was, at first, anti-erosion Task L-100 paint, which was tricky to apply;¹⁵⁸ 300 kits of this went to the desert on 28 September 1990;¹⁵⁹ and, quickly thereafter, polyurethane tape followed. For the engine, and the auxiliary power unit (APU), the AVSCOM devised various filters. Tape and filters became undying topics at the daily Desert Shield, and later Desert Storm, conferences. The first tape kits were ready by 28 September 1990,¹⁶⁰ and the development of both an Engine Air Particle

¹⁵⁷MSG, AMCOOC-RE, to the USACINCENT, 12 September 1990, subject: SITREP/USARCENT MAIN 83.

¹⁵⁸Historian, NDSC, 20 September 1990,

¹⁵⁹Historian, NDSC, 28 September 1990, notes cited.

¹⁶⁰Ibid.

Separator (EAPS) for the CH47D's engine and an Inertial Particle Separator (IPS) for the UH-60A's APU was well underway by the close of August,¹⁶¹ followed in October by work on a UH-1 IPS.¹⁶² The taping program was largely in hand by mid-December 1990,¹⁶³ and the interim particle separator about a month later.¹⁶⁴

Counter-Sand

Flying Hours

While this filter work went forward apace, one palliative, mentioned earlier, was to stay out of the sand as much as possible; that was, to reduce flying hours in the zone of operations. By 2 November 1990, three months into the play, such hours amounted to:

¹⁶¹Memo, AMSAV-L-EOC, for the Commanding General (CG), AVSCOM, 21 September 1990, subject: AVSCOM Desert Shield Daily Update.

¹⁶²MSG, AMSAV-L-EOC, to the AMCOC-RE, 5 October 1990, subject: SITREP (sic).

¹⁶³Historian, NDSC, 14 December 1990.

¹⁶⁴An issue somewhat complicated by the numerous types of separators involved. For instance, the OH-58D's, the AH-1's, and the UH-1's. For the OH-58D's, see: 1) Historian, NDSC, 28 December 1990. For the latter two, see: 2) Historian, NDSC, 14 January 1991. Finally, some of the separator resolutions came quite early; the AVSCOM awarded a contract for the CH-47 EAPS on 22 October 1990. The UH-60 and the AH-64 had separators, but nonetheless, there was sand erosion on the compressor blades of their T-700 engines, and both the UH-60 and the AH-64 needed a separator for their APUs, the 64's being a recent version of the 60's. See: 3) MSG, AMCOC-RE, to the DALO-LOC, 9 October 1990, subject: SITREP No. 55. 4) Historian, NDSC, 23 October 1990, and, 5) Conversation, Howard K. Butler with LTC Dennis Crowe, Advanced Attack Helicopter Project Manager Office, 15 April 1991.

<u>Aircraft</u>	<u>Hours of Operation</u>
AH-64	3,916
AH-1	1,083
UH-60A	6,891
UH-60L	132
EH-60	264
UH-1H	3,267
UH-1V	143
OH-58A/C	4,250
OH-58D	490
CH-47D	<u>854</u>
Total	21,290

Remembering the concentration of attention upon Saudi Arabia, the rest of the Army flying hour program had to be sliced even more severely. As this was not done until November 1990, the Army's air fleet had, when the axe fell, taken a sizeable bite out of what would be all of its FY91 totals. Thus, for instance, the AH-1, the AH-64, the CH-47D, the UH-1, and the OH-58 A and C models faced a new limit of ten flying hours per month, while the OH-58D and the UH-60 got six per month.¹⁶⁵ Even this proved much, as the ODCSLOG would later note to the AVSCOM:

"1. Appreciate the feedback we have received
from you concerning the Flying Hour
Program It is clear that the significant

¹⁶⁵Historian, NDSC, 29 November 1990.

Flying Hour Program reductions we have given you have had, and will continue to have, a dramatic impact.

"2. Our problem is a shortage of repair parts to support required flying hours. Unprogrammed Desert Shield deployments and parts consumption and greater than normal parts wear due to the environment have greatly decreased the availability of parts for the remainder of the force. The logistics community has worked arduously to increase the parts flow of (sic) both Southwest Asia and elsewhere. However, (sic) there are just not sufficient parts to meet all requirements. Accordingly, we have adjusted the flying hour program to balance parts availability with critical flight requirements. Over the past few days I reviewed in detail with AVSCOM and AMC the parts situation, examined the personnel and training aspects of the situation, took a hard look at what we are planning in the TRADOC schools, and examined our new equipment fielding plans. . . . We understand that each of you have real requirements and "must do" missions. We have given you additional hours where (sic) possible, but unfortunately, for some aircraft, we simply have

no flexibility. Support for Desert Shield must take priority. Even there, we are flying a constrained program (and even so,) as much as a third of the newly adjusted program for some aircraft may not be supported by parts You may find some aircraft (sic) remain inoperative for lengthy periods awaiting parts."¹⁶⁶

Those differences in SWA and non-SWA flying tended to grow even more pronounced in favor of the former, as this comparison of three prominent aircraft reveals:

Month

	<u>OH-58D</u>		<u>UH-60</u>		<u>CH-47D</u>	
	<u>SWA</u>	<u>Non-SWA</u>	<u>SWA</u>	<u>Non-SWA</u>	<u>SWA</u>	<u>Non-SWA</u>
September	15.0	11.6	19.4	13.8	8.9	12.7
October	12.5	9.3	20.7	11.2	16.9	11.4
November	24.9	12.1	21.2	12.6	15.1	13.7
December	20.7	4.7	14.4	10.1	16.8	8.5 ¹⁶⁷

¹⁶⁶FAX, DALO-AV, ODCSLOG, to the HQ AVSCOM, et alia, 4 January 1991, subject: FY91 Flying Hour Program (FHP).

¹⁶⁷AVSCOM, Briefing Charts, Spares, circa 6 February 1991.

As one might expect, there was some chafing at these restrictions; the Intelligence and Security Command (INSCOM), for example requested, in January of 1991, an additional 7,000 hours for its Mohawks.¹⁶⁸ Nevertheless, the restrictions remained in place.¹⁶⁹ As the AVSCOM commander explained to the CINCUSAREUR:

"2. We began the Desert Express (sic)/Storm Campaign with Spares Inventories purchased 12-18 months ago to support a peacetime flying hour program. Not only did we have to contend with lead time, but also with spares and war reserve programs that were underfunded. As the 18th Corps deployed to Southwest Asia, we experienced an immediate increase in optempo and component wearout rates that were 2-10 times greater than we've ever experienced, especially rotor blades, engines, and APUs (sic). Components have also been consumed at accelerated rates during predeployment and in theater during initial stand-down";¹⁷⁰

¹⁶⁸Information Paper, DAMO-TRP, HQ DA, 29 January 1991, subject: Mohawk Flying Hour Program (FHP)

¹⁶⁹FAX, DALO-AV, ODCSLOG, to the CDR, AVSCOM, circa 19 February 1991, subject: (FHP).

¹⁷⁰MSG, CDR, AVSCOM, to the CINCUSAREUR, Heidelberg, Germany, 26 January 1991, subject: Aviation Flying Hour Program.

Once the shooting stopped, the question of augmenting the world-wide flying hours re-arose.¹⁷¹

Trainers

The other anti-sand measure was no actual flying at all, but rather a widespread use of simulators. In late November 1990, the Project Manager, Training Devices (PM-TRADE) had undertaken planning for the relocation of an AH-64 Selected Task Trainer, an AH-64 Combat Mission Simulator (CMS), and a UH-60 Flight Simulator to SWA.¹⁷² Had the war been lengthy, undoubtedly more such devices would have undergone deployment.

Readiness: To and Fro

1 October 1990 to 4 March 1991

Review

The onset of FY91 found the AVSCOM on what, with very minor deviations, would be a set course for the remainder of the Southwest Asian interlude. It had not only addressed the major obstacles to Army aviation in the theatre, but it had also attempted to anticipate war by the placement, in the zone of operations, of both a reserve of parts and of a somewhat sophisticated repair capacity. The AVSCOM's exertions already covered, and would continue to reach over, innumerable actions, for the sand was, and would be, the only intractable foe which the airplane would encounter.

¹⁷¹Historian, NDSC, 15 March 1991.

¹⁷²FAX, DAMO, HQ DA, to the COMUSARCENT MAIN, et alia, 28 November 1990, subject: Aviation Training Aids, Devices and Simulators (TADS).

Rates

The primary objective of Army aviation, in SWA and elsewhere, was to keep this airplane, and all of the others, aloft, or "ready" to go. To hold this homily current, the HQ DA set, as aforementioned, at first, an unreasonable 90, then quickly thereafter an 80 percent readiness rate standard. From the start to the finish, the aircraft in SWA were rarely below this measure; the largest deficits came early in the game, when unassembled aircraft on the piers counted in the total. Constancy was the watchword. On 1 October 1990, as our period began, we find:

<u>Aircraft</u>	<u>Number</u>	<u>Number MC¹</u>	<u>Percent MC¹</u>
AH-64A	109	93	85
UH-60	180	137	76
EH-60	9	7	78
OH-58C	118	98	83
OH-58D	41	36	88
CH-47D	79	63	80
AH-1	48	37	77
UH-1	<u>54</u>	<u>43</u>	<u>80</u>
Total	638	514	81

¹Mission Capable. Incidentally, the Army had a higher category than Mission Capable, being Fully Mission Capable. The lessor category applied in SWA.¹⁷³

¹⁷³FAX, DALO-AV, ODCSLOG, to the AVSCOM-L-EOC, 10 October 1990, subject: Summary Aircraft Statistics.

. just over five months later, with nearly three times as many aircraft in the zone of operations, we see:

<u>Aircraft</u>	<u>Number</u>	<u>Number MC</u>	<u>Percent MC</u>	<u>Authorized Number</u>
AH-64A	266	239	90	287
UH-60	350	284	81	364
UH-60V	64	60	94	53
EH-60	27	21	78	29
OH-58C	322	295	92	342
OH-58D	100	88	88	111
CH-47D	158	134	85	162
AH-1	141	127	90	198
UH-1	212	167	79	237
UH-1V	<u>181</u>	<u>158</u>	<u>87</u>	<u>141</u>
Total	1,821	1,573	86	1,922 ¹⁷⁴

Rates hovered about those two poles all through these five months, with long-term, steadily upward movement. As instances, the 31 October 1990 rate for 936 aircraft was 79 percent;¹⁷⁵ the 5 December 1990 rate for 985 aircraft was 83 percent;¹⁷⁶ the 19 January 1991 rate for 1,593 aircraft was 85 percent;¹⁷⁷ and the 16 February 1990 rate reached a near peak of 89 percent.¹⁷⁸

¹⁷⁴FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 4 March 1991, subject: Summary Aircraft Status.

¹⁷⁵FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 2 November 1990, same subject.

¹⁷⁶FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 6 December 1990, same subject.

¹⁷⁷FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 20 January 1991, same subject.

¹⁷⁸FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 17 February 1991, same subject.

Using the Army's higher standard, Fully Mission Capable, incidentally produced some entirely different results, as this 26 February 1991 summary of Echelons Above Corps (EAC) aircraft readiness showed:

<u>Aircraft</u>	<u>Authorized</u>	<u>On-Hand</u>	<u>MC</u>	<u>FMC</u>	<u>Percent Ready</u>	<u>Percent FMC</u>
AH-64	4	4	3	0	75	0
CH-47	45	45	42	3	100	6
UH-60A	24	26	12	15	65	58
UH-60V	12	12	11	1	100	8
UH-1V	42	42	39	0	93	0
UH-1H	6	6	3	1	67	16 ¹⁷⁹

Rate Inhibitors

The reverse of "ready" fell into, in Army parlance, two categories: Not Mission Capable, Maintenance (NMCM) and Not Mission Capable, Supply (NMCS). Generally, the numbers in the two categories were approximately equal; on 2 October 1990, 18 of the 109 AH-64s were out of service, 9 each NMCM and NMCS; and of 58 UH-60s in the same state, 26 were NMCM and 32 NMCS. Conversely, for the UH-1s, 30 were NMCM and 2 NMCS.¹⁸⁰ Eighteen days later, the AH-64 and UH-60 figures were 11 and 10 and 24 and 23, respectively; the UH-1 figures had balanced at 13 and 11, respectively; and this time, the major imbalance - a reversal - was for the AH-1, with six NMCM and 19 NMCS.¹⁸¹

¹⁷⁹FAX, AMCOOC-RE, to the AMSAV-L-EOC, 27 February 1991, subject: ARCENT SUPCOM LOGSTIREP - EAC Aircraft (sic).

¹⁸⁰FAX, DALO-AV, ODCSLOG, to the AVSCOM-L-EOC, 4 October 1990, subject: Summary Aircraft States.

¹⁸¹FAX, DALO-AV, ODCSLOG, to the AVSCOM-L-EOC, 22 October 1990, same subject.

The AH-64 Apache figures could have been far worse; its highly publicized failings, such as the swashplate, had been the subjects of a 3-year long corrective program,¹⁸² which began to tell in FY90. From September 1989 to August 1990, the Apache's MC rose from 55 to 75 percent and its FMC rate from 22 to 68 percent.¹⁸³

Thus there were no prominent maintenance or supply subjects during these five months, only special problems which arose, it can be said, normally. Hence, a 20 October report on the AH-64 showed a need for such parts as "a stabilator bushing, a fuel cell, (a) generator, some stabilator assemblys (sic), (and a) Hyd (raulic) Manifold, "while the UH-60 lacked " M/R (main rotor) blades, an APU, an engine, starter, (and an) accessory module" ¹⁸⁴ Such reports dwelled on the negative; as the statistical reports showed, usually two, or no more than three, aircraft types attained the 80 percent DA MC standard, and the "failures" were typically a point or two below the bar, and even this was, at the beginning, caused by too few aircraft in a category, such as three of only nine EH-60s down on 25 October 1990.¹⁸⁵

¹⁸²1) AVSCOM, Annual Historical Review, FY1988, pp. 155-156. 2) There was, moreover, an adequate supply of said swashplates: Historian, NDSC, 16 October 1990.

¹⁸³Memo, Mr. Joseph P. Cribbins, Special Assistant to the ODCSLOG, ODCSLOG, 3 October 1990, subject: Apache Readiness.

¹⁸⁴MSG, AMCOG-RG, to the AVSCOM, et alia, 21 October 1990, subject: LOGSTAT RPT/No. 45.

¹⁸⁵MSG, AMCRE, HQ, AMC, to the AVSCOM-L-EOC, 25 October 1990, subject: (System Assessment Charts).

The AH-1, the UH-1H, and the heavily used UH-60 were the early regular readiness culprits. The AH-1 "E" version lacked the Inertial Particle Separator (IPS); its remedy was a plan to replace the "Es" with 24 AH-1Fs. The UH-1H had a similar problem, but it was to be the subject of an IPS MWO. The UH-60 needed both blade taping and an APU IPS.¹⁸⁶ All of the other types, such as the OH-58C and the CH-47D, also suffered from a lack of erosion protective equipment.¹⁸⁷

For the remainder of our five months, samplings of maintenance problems of various aircraft at various points include:

- 13 November 1990, AH-64 - blades, transmissions, phase (regularly scheduled) maintenance modifications, and hydraulic manifold;¹⁸⁸
- 28 November 1990, UH-60 - NMCM: phase maintenance, sheet metal repairs, engine failures, and hydraulic leaks. NMCS: gear boxes, input modules, and blades;¹⁸⁹

¹⁸⁶MSG, AMCCOC-SM, HQ AMC, to the AMSAV-L-EOC, 2 November 1990, subject: Desert Shield Briefing to Chief of Staff, 2 November 1990.

¹⁸⁷MSG, AMCCOC-RE, to the AVSCOM-L-EOC, et alia, 8 November 1990, subject: AMC-SWA SITREP 79, 8 November 1990.

¹⁸⁸MSG, COMUSARCENT MAIN, to the AVSCOM-L-EOC, et alia, 13 November 1990, subject: LOGSTAT Report/No. 69.

¹⁸⁹MSG, AMCCOC-RE, to the AVSCOM-L-EOC, et alia, 28 November 1990, subject: AMC-SWA SITREP 97, 28 November 1990.

- 26 December 1990, AH-1 - NCM - swashplates, oil pressure problems, trunnion bearings, main rotor (MR) hub assembly, fuel loss, tail rotor (TR) gear box, transmissions, phase maintenance, and so forth;¹⁹⁰
- 27 February 1991, OH-58C - TR blade (TRB) repair, engine, chin bubble, exhaust stacks;¹⁹¹
- and, 4 March 1991, CH-47, oil cooler bracket, main fuel bladder, phase maintenance, and failed vibration test.¹⁹²

Recognition

As the preceding pages repeatedly demonstrate, the AVSCOM had attempted to arrest the major culprit for the lack of readiness, aircraft equipment deficiencies, by the dispatch of a wide spectrum of items, including aircraft survivability equipment, (ASE)¹⁹³ clamshells, airfield matting,¹⁹⁴ ground covers,¹⁹⁵ anti-erosion paint, a ground positioning navigation system¹⁹⁶ a

¹⁹⁰ Memo, AMC-SWA, for the Deputy Chief of Staff (DCS) for Readiness, HQ AMC, 26 December 1990, subject: SITREP #123, 26 December 1990.

¹⁹¹ Memo, AMC-SWA, for the DCS for Readiness, HQ AMC, 27 February 1991, subject: SITREP #187, 27 February 1991.

¹⁹² FAX, ARCENT SUBCOM, to the AVSCOM-L-EOC, et alia, 6 March 1991, subject: Aircraft.

¹⁹³ MSG, AMSAV-L-EOC, to the AMCC-RE, 6 October 1990, subject: (Operation Desert Shield.)

¹⁹⁴ MSG, AMSAV-L-EOC, to the AMCC-RE, 7 October 1990, (same subject).

¹⁹⁵ MSG, AMSAV-L-EOC, to the AMCC-RE, 12 October 1990, (same subject).

¹⁹⁶ 1) MSG, AMSAV-L-EOC, to the AMCC-RE, 10 October 1990, (same subject).
2) MSG, AMSAV-L-EOC, to the AMCC-RE, 30 October 1990, same subject.

CH-47D oil cooler shroud, a personnel locator system (PLS) survival radio,¹⁹⁷ aircraft covers,¹⁹⁸ glass polishing kits,¹⁹⁹ a divisional shop set, aviation maintenance ladders,²⁰⁰ and on, ad infinitum. Again, as noted previously, the AVSCOM complemented the goods with personal services in the form of special engineering teams, IARs, and CFSRs.²⁰¹ Such concentration had, till now, produced excellent results, but the initiation of Phase II, the deployment of the VII Corps from Europe, would require an even greater effort:

"We have received outstanding support from AVSCOM for our helicopter fleet and our mission capable rates reflect that. In the near future, more helicopters will be added to the theater and optempo (operational tempo) will increase. We need to do the following Increase the blade taping and painting capability in country at TAMP-SA, (, find) . . . a final solution to blade erosion (, and) attempt to expedite (an) engine air particle separator for the CH-47 Most importantly, we need to

¹⁹⁷MSG, AMSAV-L-EOC, to the AMOOC-RE, 11 October 1990, (same subject).

¹⁹⁸MSG, AMSAV-L-EOC, to the AMOOC-RE, 13 October 1990, same subject.

¹⁹⁹1) MSG, AMSAV-L-EOC, to the AMOOC-RE, 14 October 1990, (same subject);
2) MSG, AMSAV-L-EOC, to the Commander, Laboratory Command (LABCOM), Adelphi, Maryland, 27 October 1990, subject: SITREP No. 79.

²⁰⁰MSG, AMSAV-L-EOC, to the AMOOC-RE, 17 October 1990, subject: Operation Desert Shield.

²⁰¹Ltr, BG D. T. Irby, Deputy Commander, AVSCOM, to BG Scholes, CS, XVIII Airborne Corps, 19 October 1990, subject: Aircraft Readiness Initiatives for Desert Shield.

minimize the number of quick change assemblies (QCA)
for all types (of aircraft) by eliminating
the requirement to build up engines at AVIM/AVUM we
can reduce engine change from 6-8 hours to 1-2 hours
. . . . (, and we also) need to increase the number
of field maintenance representatives . . . (to an)
appropriate level to support VII Corps aviation units
. . . . "202

Revisitation

General

The AVSCOM, therefore, had a deceptively simple course to follow for the duration of operations in SWA. That was, do what it had been doing, but on a larger scale. With a few innovations, such as the General Irby "road show" to help deploying Phase II units, the command did exactly that from October of 1990 to March of 1991. These efforts divided, roughly, into three categories - technical, materiel (support equipment), and spares (parts); the chief points of which our text will now discuss in turn:

²⁰²Writer's Note: Interestingly, the following citation noted that the Vice President of General Electric, on tour in SWA, observed " . . . the engine was not developed to operate in the fine sand . . . and that engines are showing excessive wear even with the Inertial Particle Separator." See: MSG, USA Logistics Assistance Office (LAO) CONUS, to the AVSCOM-L-EOC, et alia, circa 27 November 1990, subject: ARCENT SUPCOM (PROV) Logsitrep #112.

Technical

Engines and Filters.

So intimately bound together by the sand as to be unable to discuss separately, engines and filters unfortunately began, in the main, life in the desert apart. Engines could not there abide alone; on 6 October 1990, the COMUSARCENT reported 30 to 50 hours engine life ranges for the AH-1, UH-1, and CH-47 helicopters.²⁰³ While there were still enough engines in stock to counter this extremely high attrition rate, which ranged from approximately 10 to 15 times more than average wear,²⁰⁴ the AVSCOM could not keep pace indefinitely, even with special training procedures,²⁰⁵ with particular concern for the T-700 engine, which powered both the heavily used Black Hawk and the Apache attack helicopter,²⁰⁶ and for the T-55-L-712, the CH-47D Chinook's engine;²⁰⁷ the Chinook had to curtail severely flying with the 30-hour life expectancy of its engine.²⁰⁸

²⁰³MSG, CDR, Forces Command (FORSCOM), Fort McPherson, Georgia, to ARCENT MAIN, Riyadh, Saudi Arabia, 6 October 1990, subject: Aviation Issues for ARCENT SUPCOM LOGSTIREP NUMBER 5.

²⁰⁴1) Historian, NDSC, 4 October 1990, and 2) Historian, NDSC, 5 October 1990.

²⁰⁵MSG, AMSAV-L-EOC, to the AMCOC-RE, et alia, 16 October 1990, subject: (Operation Desert Shield).

²⁰⁶MSG, AMCOC-RE, to the AVSCOM-L-EOC, et alia, 20 October 1990, subject: AMC-SWA SITREP #42, 2 October 1990.

²⁰⁷Writer's Note: The 101st, which had worn out 11 CH-47D engines by early October 1990, called for the shipment of condition "B" engines to them, a call repeated by the AMC six days later. See: 1) MSG, AMCOC-RE, to the AVSCOM-L-EOC, et alia, 10 October 1990, subject: AMC-SWA SITREP 50, 10 October 1990, and 2) MSG, AMCOC-RE, to the AVSCOM-L-EOC, et alia, 16 October 1990, subject: AMC-SWA SITREP 56, 16 October 1990.

²⁰⁸Historian, NDSC, 14 November 1990.

Due to the need to train and to move about to avoid missiles, grounding was not an appropriate answer. Nor was paving the landing spots, although the latter solution would be an enormous engine saver in secure areas.²⁰⁹ Immediacy dictated interim solutions, and so the development and dispatch of filters for every air-sucking engine, to include APUs, became a high command concern.

The result was an effort that continued up to the start of the war, although the command largely had the situation in hand by 1990's end. Examples of highlights of this included the development and fabrication of 2,000 UH-60 APU IPS filters,²¹⁰ the procurement of 100 EAPS for the CH-47s in SWA,²¹¹ the initiation of a 2-phased UH-1 IPS MWO undertaking;²¹² the development and manufacture of a "sock," or Engine Inlet Barrier Filter for the CH-47D's T-55-L-712 engine,²¹³ and the development and fabrication, by AVSCOM

²⁰⁹Writer's Note: The AVSCOM Commander thought a \$3,000,000 investment in asphalt very worthwhile. See: 1) Historian, NDSC, 24 October 1990, and 2) MSG, AMSAV-L-EOC, to the COMUSARCENT Engineer, 9 December 1990, subject: Asphalt for Aviation Units.

²¹⁰1) MSG, AMCOOC-RE, to the AMSAV-L-EOC, et alia, 16 November 1990, subject: (Operation Desert Shield). 2) MSG, AMCOOC-RE, to the AMSAV-L-EOC, et alia, 5 January 1991, subject: SITREP No. 149. 3) MSG, AMSAV-L-EOC, to the AMCOOC-RE, 5 January 1991, same subject.

²¹¹MSG, AMSAV-L-EOC, to the AMCOOC-RE, et alia, 12 December 1990, subject: (Operation Desert Shield).

²¹²1) MSG, AMSAV-L-EOC, to the AMCOOC-RE, 11 December 1990, subject: (Operation Desert Shield). 2) MSG, AMCOOC-RE, to the DAIO-LOC, 12 December 1990, subject: AMC SITREP No. 119.

²¹³1) MSG, AMSAV-L-EOC, to the AMCOOC-RE, et alia, 7 January 1991, (same subject). 2) MSG, AMSAV-L-EOC, to the AMCOOC-RE, 7 January 1991, (same subject). 3) Margaret A. Banish, "The 'Sock' Keeps Sand Out of Chinook Engines," Gateway Reporter, Volume 14, Number 3, February 20, 1991, pp. 1,8.

engineers, of an AH-1 engine inlet pillow, or deflector, with an exploration of expedient manufacturing options to ensue.²¹⁴ Even these successes, to re-emphasize, were interim, and therefore not entirely satisfactory, measures; despite the filters, the XVIII Airborne Corps' troubles with both its APUs²¹⁵ and its CH-47D EAPS continued;²¹⁶ the former were, moreover, difficult to maintain.²¹⁷ Consequently, the AVSCOM had sufficient troubles in this matter that it had to recommend against such proposals as the addition of an AH-64 Attack Helicopter Battalion (AHB) to the 1st Infantry Division²¹⁸ or an increase in the maximum gross weight of the CH-47D from 50,000 to 54,000 pounds in order to enable that craft to carry more cargo.²¹⁹ Finally, one aircraft model, the AH-1E, had, besides its lack of filters, such a

²¹⁴MSG, AMSAV-L-EOC, to the AMCC-RE, et alia, 24 January 1991.

²¹⁵1) MSG, CDR, AVSCOM, to the CDR, XVIII Airborne Corps, 28 December 1990, subject: APU. 2) MSG, AVSCOM-L-EOC, to LTC Oler, AMC-SWA, 2 January 1991, (same subject).

²¹⁶MSG, AVSCOM-L-EOC, to the AMCC-RE, et alia, 20 February 1991, subject: (Operation Desert Storm).

²¹⁷MSG, AMCC-RE, to the AVSCOM-L-EOC, 16 December 1990, subject: Information From AMC-SWA SITREP 113, 18 December 1990.

²¹⁸MSG, AMCC-RE, to the AVSCOM-L-EOC, et alia, 12 December 1990, subject: Request for Additional AH-64 Battalion for 1st INF DIV.

²¹⁹MSG, AMSAV-L-EOC, to the AMCC-RE, et alia, 30 December 1990, subject: Operation Desert Shield.

vulnerability to air defense artillery²²⁰ that a program began to replace all of the AH-1 "Es" with AH-1 "Fs."²²¹

Blades.

Flying only 15 hours per month, an Apache in SWA with unprotected blades would require replacement of all of its blades, both main and tail, every two months.²²² Since such attrition was common to the whole air fleet, the AVSCOM had to find an immediate remedy, even though, as with engines, it had what would normally be an ample supply of blades.²²³ The best solution was a more resistant blade, but only the OH-58D currently had such a boon ready, a

²²⁰MSG, CDR, XVIII Airborne Corps, to the COMUSARCENT, 30 November 1990, subject: Aircraft Swapouts.

²²¹Writer's Note I: Twenty-four AH-1Fs were the substitutes; the AH-1F had an IPS. See: 1) MSG, AMCOCC-RE, to the AVSCOM-L-EOC, et alia, 12 October 1990, subject: (Operation Desert Shield). 2) MSG, AVSCOM-L-EOC, to the AMCOCC-RE, 13 October 1990, (same subject). 3) By 12 January 1991, 35 of 54 "Es" had left Saudi Arabia: MSG, Aviation PEO, St. Louis, to the TAMP-SA, 12 January 1991, subject: Retrograde of AH-1E Cobras from Southwest Asia. Writer's Note II: The AVSCOM issued cleaning and changing instructions with its filters, i.e., for the UH-60, 1) MSG, AVSCOM-L-EOC, to the AMCOCC-RE, 16 October 1990, subject: (Operation Desert Shield). 2) MSG, AMCOCC-RE, to the DALO-AV, 18 November 1990, subject: AMC SITREP No. 095. Writer's Note III: The AVSCOM, incidentally, also began the development of a Nuclear, Biological and Chemical Filter for the AH-64: MSG, AMCOCC-RE, to the DALO-LOC, 25 November 1990, subject: AMC SITREP No. 101.

²²²1) Historian, NDSC, 1 October 1990. 2) The XVIII Airborne Corps was reporting that main and tail rotor blades were unserviceable after 26 hours of use: MSG, DALO-ZA, ODCSLOG, to the AMCOCC-RE, et alia, 25 October 1990, subject: DCSLOG Saudi Arabia Trip Report.

²²³Historian, NDSC, 2 October 1990.

heavier, more opaque, polyester-tipped main rotor blade, the first sets of which were due to arrive in the zone of operations the 9th or 10th of October 1990.²²⁴ Consequently, blades became a topic which hotly vied with engines as the chief attention-getter at the daily AVSCOM Desert Shield conferences throughout the remainder of 1990.

As discussed earlier, the first solution was an anti-erosion polyurethane paint called Task-L-100. By 26 September 1990, 300 paint "kits" were in Saudi Arabia,²²⁵ followed by a motion picture on a "video," that was, a reel of film enclosed in a plastic case.²²⁶ The paint's fatal weakness was rain, which washed it away;²²⁷ this was seldom, however, a problem in Arabia. More importantly, the paint had a very thick consistency and therefore was difficult to apply smoothly,²²⁸ and it wore off rather rapidly during blade use.²²⁹

AVSCOM reliance, then, turned to Team Tape.²³⁰ Rain also affected the 3M company's product, making small holes ". . . from the impingement (sic) of

²²⁴MSG, AVSCOM-L-EOC, to the AMCOOC-RE, 9 October 1990, subject: (Operation Desert Shield).

²²⁵Historian, NDSC, 26 September 1990, notes cited.

²²⁶MSG, AVSCOM-L-EOC, to the AMCOOC-RE, circa 9 October 1990, subject: (Operation Desert Shield).

²²⁷MSG, AMSAV-L-EOC, to the AMCOOC-RE, 1 November 1990, (same subject).

²²⁸Briefing, Directorate for Engineering, Headquarters, AVSCOM, 1 October 1990.

²²⁹Briefing, Directorate for Engineering, Headquarters, AVSCOM, 2 November 1990.

²³⁰MSG, AVSCOM-L-EOC, to the AMCOOC-RE, circa 29 October 1990, subject: (Operation Desert Shield).

water droplets." Otherwise, the tape wore well and virtually put an end to wholesale erosion,²³¹ which already had made major inroads on the main and tail rotor blades.²³² By mid-December 1990, taping was underway at six different locations with an aim to be completed by 15 January 1990.²³³

Windshields.

The third target, in prominence, of the sand was the windshield, which it pitted and scratched. With the OH-58, AH-1, and AH-64 aircraft as priorities, and with contractor aid,²³⁴ the stage was set for, as one might now well guess, Team Glass, which was to concern itself with transparency coatings, 3-M polishing kits, and Government Services Administration (GSA) orbital sanders.²³⁵ The team had 11 transparency components ready for shipment to SWA by mid-October 1990.²³⁶ The 101st Airborne Division (ASLT) was the test

²³¹MSG, AMSAV-L-EOC, to the AMCOO-RE, 31 October 1990, (same subject).

²³²MSG, AMSAV-L-EOC, to the AMCOO-RE, 7 November 1990, subject: Weapons Systems Management - SWA.

²³³1) Historian, NDSC, 14 December 1990, notes cited. Writer's Note I: After taping, the blades had to be balanced, a task which involved over 8,000 blades. See: 2) Historian, NDSC, 27 November 1990. Writer's Note II: The main rotor blade tips were the subject of a separate and major effort involving tip caps and "touch ups" of said caps . . . 3) Memo, Deputy Commander, AVSCOM, to the CDR, AMC, 14 November 1990, subject: Weapons Systems Management - SWA. 4) MSG, AMCOO-RE, to the DALO-LOC, 10 December 1990, subject: AMC SITREP No. 115. . . . and molded polymer boots - this last for the Apache. See: 5) Historian, NDSC, 10 December 1990. 6) MSG, AVSCOM-L-EOC, to the AMCOO-RE, et alia, 16 February 1991, subject: (Operation Desert Storm).

²³⁴Briefing, Directorate for Engineering, Headquarters, AVSCOM, 21 September 1990.

²³⁵1) Writer's Note: By 14 October 1990, Swedlov, Incorporated, had seven transparencies for their hard coating ready for test and the 3M Corporation had a windshield polishing kit which was a significant improvement over the micro-mesh kit in stock. See: MSG, AMSAV-L-EOC, to the AMCOO-RE, 14 October 1990, subject: Operation Desert Shield. 2) MSG, AVSCOM-L-EOC, to the AMCOO-RE, circa 15 October 1990, (same subject).

²³⁶MSG, AVSCOM-L-EOC, to the AMCOO-RE, 16 October 1990, (same subject).

subject or, rather more specifically, various glass panels²³⁷ on two of its OH-58s, two of its AH-64s, and one of its UH-60s.²³⁸ After application to the 10 windows involved, a comparison was to follow with these 10 "pitted" against 10 uncoated windows.²³⁹ The test, unfortunately, was not over until after the war began,²⁴⁰ and nothing came of it in any event.

Bearings.

The final sand marks were those exposed bearings. Sand so quickly contaminated the grease of these bearings that the AVSCOM began to weigh the use of teflon-coated bearings.²⁴¹ Tests, however, showed that teflon-coated bearings had remarkably short lives, and they led the AMC to conclude that, long-term, a redesign of the elastomeric bearing was in order.²⁴² In the interim, the AVSCOM revived rubber "boots" to cover the bearings; said boots had received "the boot" for their propensity to retain moisture and thus induce premature rust.²⁴³ As with windshields, a boot test was the next step; a

²³⁷MSG, AMSAV-L-EOC, to the AMOOC-RE, 1 November 1990, (same subject).

²³⁸MSG, AVSCOM-L-EOC, to the AMOOC-RE, 13 November 1990, (same subject).

²³⁹Briefing, Directorate for Engineering, Headquarters, AVSCOM, 29 November 1990, p. 2.

²⁴⁰Historian, NDSC, 1 February 1991.

²⁴¹Briefing, Directorate for Engineering, Headquarters, AVSCOM, 28 September 1990.

²⁴²MSG, AMSAV-L-EOC, to the CDR, LABCOM, Adelphi, Maryland, subject: SITREP No. 74.

²⁴³NDSC, 27 September 1990, notes cited.

shipment of 18 sets of rubber boots went to Saudi in November. Six UH-60Ls were to fly with the boots on their flight control rod end bearings, and six were to fly unprotected.²⁴⁴ For the rest of the fleet, new grease lubrication procedures appeared, as well as tool sets to replace the bearings already damaged, such as those on the AH-64.²⁴⁵

Covers.

While the four preceding efforts concerned aircraft in operation, a surer means of protection was to blanket them while they were at rest. Development of a wide variety of covers - canopy, armament, and blade - embracing several aircraft models - AH-64, AH-1, CH-47, UH-1, OH-58C, and OH-58D - began as early as September 1990.²⁴⁶ Prominent among these were two Langdon Company efforts, one, an AH-1 cover kit, completed in the first half of November 1990,²⁴⁷ and the other, a prototype AH-64 cover,²⁴⁸ which started to receive tests at Fort Eustis, Virginia, in early December of 1990.²⁴⁹ The Eustis trials had two

²⁴⁴MSG, AMSAV-L-EOC, to the AMCOC-RE, 21 November 1991, subject: (Operation Desert Shield).

²⁴⁵MSG, AMSAV-L-EOC, to the AMCOC-RE, 16 November 1990, (same subject).

²⁴⁶Briefing, Directorate for Engineering, Headquarters, AVSCOM, 25 September 1990.

²⁴⁷MSG, AMSAV-L-EOC, to the AMCOC-RE, 8 November 1990, subject: (Operation Desert Shield).

²⁴⁸MSG, AMSAV-L-EOC, to the AMCOC-RE, 9 November 1990, (same subject).

²⁴⁹MSG, AMSAV-L-EOC, to the AMCOC-RE, circa 13 December 1990, (same subject).

interesting derivations; the 10-13 December run showed that one universal blade cover would fit the AH-64, UH-60, CH-47D, and AH-1 (with composite blades), and that three prototype covers for the OH-58 generally fit.²⁵⁰

Perhaps the most noteworthy cover of all, though, was the Sikorsky-designed Climatic Heat Protective Screen, or CHAPS. Capable of enshrouding a helicopter in seven minutes,²⁵¹ the CHAPS "got lost" in Arabia for some time, causing the commander no little consternation²⁵² until its discovery in Dhahran, six days later.²⁵³

ASE.

Sand aside, hostile guided missiles were the biggest challenge to Army aviation

"1. The current situation in Southwest Asia exposes U.S. Army aviation to a sophisticated IR missile threat. In addition to the older SA-7 and SA-9 threats which can be countered by the AN/ALQ-144, Iraqi forces are in possession of the SA-13, SA-14 and Basic Stinger Missile. The AN/ALQ-144 does not have sufficient jamming power to counter the SA-14, SA-16 and basic stinger when it is used

²⁵⁰MSG, AMSAV-L-EOC, to the AMCOCC-RE, 15 December 1990, (same subject).

²⁵¹Editor, "Now You See It - - - Now You Don't," Gateway Reporter, Volume 13, Number 21, November 21, 1990, p. 1.

²⁵²Historian, NDSC, 9 October 1990.

²⁵³Writer's Note: More to follow on the supply system for now: Historian, NDSC, 15 October 1990.

on suppressed Army aircraft. The addition of this countermeasure (the AN/ALQ-144A(V) will significantly enhance the survivability of Army aircraft.

"2. The (PM ASE) is preparing to support . . . fielding (of the AN/ALQ-144A(V)) The initial fielding of the systems are (sic) targeted for (the) Apache Cobra and Black Hawk. The contractor will also ship 4 spare transmitters along with the systems (and all of which) were taken from the assembly line

"3. (The) fielding team (is) to deploy 26 November 1990."²⁵⁴

As the preceding would indicate, countermeasures, known as aircraft survivability equipment, or ASE, were a continuing concern. ASE embraced not only equipment per se, but also men and modifications. As instances, to answer the ROLAND II threat to the AH-64 entailed a reconfiguration of that craft's radar jammer,²⁵⁵ and to ensure that the replacement AH-1Fs had all of their necessary ASE in Arabia, the

²⁵⁴MSG, COL Thomas E. Reinkober, PM ASE, for the CDR, CECOM, 1 November 1990, subject: Proposed Fielding of the AN/ALQ-144A(V) for Operation Desert Shield.

²⁵⁵MSG, CDR, CECOM, to the U.S. Army Aviation Center (USAAVNC), Fort Rucker, Alabama, 9 November 1990, subject: Iraqi ROLAND Threat to AH-64 in Operation Desert Shield.

" PMO (Project Management Officer) had a team on-site at the unit making sure ASE was on hand and installed prior to deployment. As improved systems became available, our ASE teams will handcarry (sic) them over and install them and purge the old ones from the unit."²⁵⁶

The 3-man team, which would be installing AN/ALQ-144A jammers on the AH-1Fs and AH-64s, would be carrying 10 boxes weighing 596 pounds each, would leave two spares at each AVIM, and would require a two and a half ton truck to carry the 36 systems and four spares.²⁵⁷ The team was to be at Dhahran on 27 November 1990.²⁵⁸ The jammers were to protect the airplanes against the SA-13, SA-14, and Basic Stinger Missiles.²⁵⁹

The team was but a first step. The front-line Apaches were an immediate priority,²⁶⁰ as were the UH-60s of the 101st. Paradoxically, the Army policy

²⁵⁶MSG, AMSAV-L-EOC, to the AMOOC-SMC, HQ AMC, 2 November 1990, subject: (Operation Desert Shield).

²⁵⁷Memo, Mr. Donald L. Roth, Chief, Logistics Management Division, PMO, ASE, for the CDR, AVSCOM, 6 November 1990, subject: Materiel Exchange Schedule AN/ALQ-144A Jammer for Southwest Asia.

²⁵⁸Memo, Mr. Donald L. Roth, Chief, Logistics Management Division, PMO, ASE, for the Director of Readiness, Headquarters, AVSCOM, circa 20 November 1990, same subject.

²⁵⁹MSG, Project Manager (PM) ASE, to the CDR, CECOM, (1 November 1990), subject: Proposed Fielding of the AN/ALQ-144A(V) for Operation Desert Shield.

²⁶⁰MSG, COL Thomas E. Reinkober, PM, ASE, for COL Stuart Gerald, Commander, Division Support Command (DISCOM), 101st Airborne Division (AASLT), et alia, 20 November 1990, subject: Aircraft Survivability Equipment (ASE).

of giving the newest aircraft to a top-of-the-line unit back-fired in this case; the 101st had received the first UH-60s off the assembly line, but these did not have - or 133 of 145 of them did not have - the ASE protection that later aircraft did. The missing item, the Hover Infrared Suppressor System (HIRSS), made the UH-60's " survivability marginal" Other aircraft needing attention were the OH-58D, whose mast-mounted sight (MMS) was an infrared (IR) heat source; the CH-47D, which needed "B" kits for its AN/APR-39 Radar Warning Receivers (RWRs); 27 UH-1H and UH-1Vs, 25 of which lacked the same kit, two of which wanted the "A" kits, and all of which needed an engine exhaust suppressor system; and the AH-1E, which was so hopeless that it required replacement by the AH-1F.²⁶¹

November and December of 1990 were frantic months for the ASE PMD. It accelerated both production and parts deliveries, issued pertinent instructions,²⁶² effected the necessary coordination with the CECOM,²⁶³ arranged for shipments to the theater,²⁶⁴ made in-country installations, and

²⁶¹Ltr, COL Stuart Gerald, CDR, DISCOM, 101st Abn Div (AASLT), to COL Thomas E. Reinkober, PM, ASE, circa 24 April 1991, subject: Aircraft Survivability Equipment Issues.

²⁶²Memo, COL Thomas E. Reinkober, PM, ASE, for COL Stuart Gerald, CDR, DISCOM, 101st Abn Div (AASLT), et alia, 20 November 1990, subject: Aircraft Survivability Equipment (ASE) Issues.

²⁶³Ltr, CDR, CECOM, to the PM, ASE, 9 November 1990, subject: Proposed Fielding of the AN/ALQ-144A(V) for Operation Desert Shield.

²⁶⁴Ltr, Mr. Donald L. Roth, Chief, Logistics Management Division, to LTC Oler, AVSCOM Forward, Dhahran, 4 December 1990, subject: (Proposed AN/ALQ-144A Delivery Dates to Dover Air Force Base, Delaware for Trans-shipment).

entertained extra requests, such as APR-39(V)1 Radar Detecting Sets for UH-1V medical evacuation (MEDEVAC) helicopters.²⁶⁵

As one might expect, the ASE, PMO, did not, in so short a time, resolve all of the many ASE deficiencies of the Army air fleet in SWA. On 1 January 1991, for example, the commander of the 101st Abn Div (AASLT) complained that only 11 of his 37 UH-1H/V aircraft had IR suppressor systems.²⁶⁶ Moreover, ASE work continued, as in the proposed installation of a hot metal plus plume engine suppressor on UH-1Hs and Vs.²⁶⁷ Nevertheless, a lone complaint about a late concern did not detract from the disappearance of ASE as a worry more than a fortnight before the President's 15 January deadline.

Global Positioning System (GPS).

The visual measurement of heights and distances proved somewhat inexact in the desert, causing several near-misses and a few non-misses of sand dunes by helicopters. The old Loran navigation equipment could not compensate for this inexactitude because of a lack of friendly ground navigation aids north of King Khalid Military City (KKMC). The solution was SLUGGER, or GPS,²⁶⁸ which took form as

²⁶⁵Ltr, COL Thomas E. Reinkober, PM, ASE, to COL Stuart Gerald, CDR, DISCOM, 101st Abn Div (AASLT), 3 January 1991, subject: In-Country Distribution of APR-39(V)1 Radar Detecting Sets to MEDEVAC Units.

²⁶⁶MSG, CDR, 101st Abn Div (AASLT), to the CDR, AVSCOM, 1 January 1991, subject: Infrared (IR) Suppressor Systems for UH-1H/V Aircraft.

²⁶⁷MSG, CDR, AVSCOM, to CDR, VII Corps, 8 February 1991, subject: Aviation Parts Support.

²⁶⁸Historian, NDSC, 25 October 1990.

"2. The Trimble Trimpack (, which was)
. . . . a commercial (sic) hand-held, battery
powered GPS manpack navigation set which
provides UTM (Universal Transverse Mercator)
and latitude-longitude coordinates and altitudes
above MSL (Mean Sea Level).

"3. Prototype installation of the GPS into the
AH-64A, UH-1H/V, UH-60A/L (including MEDIVAC (sic)),
OH-58 Armed/Unarmed, and OH-58C (including ATAS)
(Air-to-Air Stinger Missile) have been initiated.
The prototype effort for the AH-1F will be initiated
upon completion of all other prototype systems and
when sufficient funds are available.

"4. GPS installation will not be integrated
with any existing on-board navigation systems such as
doppler. Updates to the existing on-board navigation
system will be accompanied by reading one's position
on (the) GPS set and manually inputting the data to
the doppler or other navigation system.

"5. The AH-64 prototype effort is complete and
the special mission MWO (Modification Work Order) is
being staffed. All other prototype efforts are in
process

"7. Funding for A-kit production and OLR (a 3-letter project code for back-logged MWOs) installation needs to be identified. Product lead-time for A-kits is 30 days after order at a rate of 100 kits per month."²⁶⁹

The XVIII Airborne Corps had expressed an interest in the widespread use of the GPS as early as 24 October 1990, both for ground and air arms.²⁷⁰ Work moved swiftly after mid-November,²⁷¹ with an objective to complete all of the prototypes by late-December.²⁷² By 2 January 1991, the Army had bought 2,016 "B" kits, of which 1,506 were suitable for aviation, and it was buying 3,500 Trimble SLGRs, or Small, Light-Weight Receivers, all of which were suitable for aviation. Further, prototype "A" kits, which had already passed qualification tests, were complete for the AH-64; the OH-58A, C and D; the CH-47D; the EH-60; the UH-60A and L; and the UH-1H and V; the AH-1Fs "A" kit was to be ready by 25 January 1991. The AVSCOM had started awarding production contracts for the "A"

²⁶⁹MSG, AMSAV-L-EOC, to the AMCOOC-RE, 14 November 1990, subject: (Operation Desert Shield.)

²⁷⁰MSG, AMCOOC-RE, to the AVSCOM-L-EOC, et alia, 24 October 1990, (same subject).

²⁷¹MSG, AVSCOM-L-EOC, to the AMCOOC-RE, 15 November 1990, (same subject).

²⁷²Ltr, MG Donald R. Williamson, CDR, AVSCOM, to the CDR, 1st Infantry Division (Mechanized), Fort Riley, Kansas, et alia, 20 November 1990, subject; Quick Reaction Global Positioning System Installation in Support of Operation Desert Shield.

kits, to be delivered at a rate of 100 per month per aircraft;²⁷³ the kits started to undergo distribution straightaway²⁷⁴ from 2 through 15 January 1991.²⁷⁵

Other Items.

Besides those preceding prolonged, paramount projects, the AVSCOM entertained several lesser requests, some of which partook of a quite serious nature. Among these were

- the ballistic blanket. The original request for this item called for its use on the floor of a seatless cabin compartment in a troop-carrying UH-60;²⁷⁶

- a new oil cooler shroud for the CH-47D. Made of fiberglass, this Boeing-designed shroud was to replace the stock shroud which melted in the desert heat. The later shroud also extended the average "life" of the shroud from 165 to 250 hours;²⁷⁷

²⁷³MSG, Project Manager (PM), Avionics, to the CDR, USARCENT, 2 January 1991, subject: Status of Global Positioning System (GPS) for Army Aircraft.

²⁷⁴1) MSG, AMSAV-L-EOC, to the AMCOCC-RE, 3 January 1991, subject: Operation Desert Shield. Writer's Note: The PM Avionics was a new office, formed 17 October 1990. See: 2) AVSCOM Permanent Order (PO) 64-1, 17 October 1990.

²⁷⁵MSG, PM Avionics, to the COMUSARCENT MAIN, 5 January 1991, subject: Status of Global Positioning System (GPS) for Army Aviation.

²⁷⁶Briefing, Directorate for Engineering, Headquarters, AVSCOM.

²⁷⁷MSG, AMSAV-L-EOC, to the AMCOCC-RE, 11 October 1990, subject: (Operation Desert Shield).

- plastic floor mats for the UH-1, AH-1, and AH-64 helicopters. The floor mats were to trap sand and chemicals²⁷⁸ and were part of an effort to provide "near" and "mid-term" Nuclear, Biological, and Chemical (NBC) protection for Army aircraft;²⁷⁹

- a helmet and visor combination to protect Apache crews from lasers;²⁸⁰

- a CH-47D Range Extension System for those 41 of the 53 Chinooks which the 101st possessed, allowing those helicopters to negotiate the vast distances required of them;²⁸¹

- an aiming light for helicopters " to enhance night flight obstacle avoidance ;"²⁸²

- and a new engine inlet deflector for AH-1, 182 ship "sets" of which were to come from production.²⁸³

²⁷⁸MSG, AMSAV-L-EOC, to the AMCOCC-RE, 9 November 1990, (same subject).

²⁷⁹Briefing, Directorate for Engineering, Headquarters, AVSCOM, 27 September 1990.

²⁸⁰MSG, HQ, AMCCOM, to the AMSAV-L-EOC, circa 16 November 1990, subject: (Operation Desert Shield).

²⁸¹1) MSG, AMCOCC-RE, to the DALO-IOC, 25 November 1990, subject: AMC SITREP No. 101. 2) MSG, AMCOCC-RE, to the AMSAV-L-EOC, 7 December 1990, subject: Hemitt Tanker Aviation Refuel System (HTAWS) (sic). Writer's Note: Such as the approximately 200 miles from King Khalid Military City to As Salaman Air Force Base. See: 3) Historian, NDSC, 26 February 1991.

²⁸²MSG, COMUSARCENT, to the CDR, XVIII Airborne Corps, 12 January 1991, subject: Aiming Light Modification for Helicopters to Enhance Night Obstacle Avoidance.

²⁸³MSG, AMSAV-L-EOC, to the AMCOCC-RE, 6 February 1991, subject: (Operation Desert Storm).

The AVSCOM also received, and successfully ignored, several vexatious calls for unnecessary modifications. The more humorous amongst these was one which called for "navigational enhancements" for the C-23B Sherpa, a light cargo airplane whose route from Dhahran to King Khalid Military City entailed following one pipeline northwest to its juncture with another pipeline, then turning left and tracking the other pipeline to the city, and reversing the plot for one's return;²⁸⁴ and what amounted to the conversion of the 1950's OV-1D Mohawk to an "E" model by the addition of storm scopes, to enable the aircraft to avoid thunderstorms;²⁸⁵ a secure Ultra-High Frequency radio²⁸⁶ and an in-flight refueling capability.²⁸⁷

Materiel

General.

Materiel support equipment largely consisted of three types: Test, Measurement and Diagnostic Equipment (TMDE); Ground Support Equipment (GSE);

²⁸⁴1) MSG, AMCOC-RE, to the AMSAV-L-EOC, 3 February 1990, subject: Request for Inertial Navigation System for ARCENT C-23B Aircraft. 2) MSG, Product Manager, Fixed Wing Aircraft, to the COMUSARCENT, 4 February 1991, subject: Navigation Enhancements for C-23B Aircraft. 3) MSG, MG Donald R. Williamson, CDR, AVSCOM, to the COMUSARCENT, 4 February 1991, same subject.

²⁸⁵1) MSG, CDR, 15th Military Intelligence (MI) Battalion (Bn), to the CDR, AVSCOM, 24 February 1991, subject: Request Immediate Shipment of Storm Scopes for 186 OV/RV-1D Aircraft. 2) MSG, COL Bennett, Director, Fielded Aviation Systems Management Office, HQ, AVSCOM, to the COMUSARCENT MAIN (16 February 1991), subject: Request for OV/RV-1D Aircraft Modification (16 February 1991).

²⁸⁶1) MSG, CDR, 15th MI Bn, to the Mission Equipment Division, Directorate for Engineering, HQ, AVSCOM, 4 February 1991, subject: Storm Scopes and Secure UHF Radio (Thunderstorms). 2) MSG, CDR, 15th MI Bn, to the Mission Equipment Division, Directorate for Engineering, HQ, AVSCOM, 23 February 1991, subject: Request for Secure UHF Radio.

²⁸⁷MSG, CDR, 15th MI Bn, to the Mission Equipment Division, Directorate for Engineering, HQ, AVSCOM, et alia, 14 February 1991, subject: Request for OV/RV-1D Aircraft Modification-in-Flight Refueling Capability.

and that MWD-added equipment, together with ancillary tools, necessary to insure, in order of importance, capability, sustainability, survivability, and safety.

TMDE.

TMDE consisted of both test sets and auxiliary equipment. Desert Shield requirements normally focused upon shortages and resultant shipments of same, such as pitot static testers, aviation vibration analyzers, nitrogen carts, alignment tools, Apache trouble-shooting breakout boxes sets, and rotor tracking and balancing-vibrex sets.²⁸⁸ By far the most significant concern was with the AVA called the Rotor Analysis and Diagnostic System - Advanced Technology (RADS-AT). An error in the "software" of RADS-AT caused intermittent blade tracking problems, and Scientific Atlanta, the RADS-AT's manufacturer, had to revise said software, which it did by 30 October 1990.²⁸⁹

GSE.

GSE embraced a wider spectrum of concerns. Interest items included moving kits, auxiliary ground power units (AGPUs), airfield matting, battle damage repair kits, light kits, special tools, shop sets, the high performance hoist, aviation ladders, and clamshells. This last item, as already noted, was the most noteworthy GSE item of the war. On 27 August 1990, the AVSCOM awarded a contract for 41 of these large, expandable shelters; the first one departed for Saudi Arabia from Tinker Air Force Base, Oklahoma, on 24 September

²⁸⁸1) Briefing, Fielded Aviation Systems, Directorate, HQ, AVSCOM, 26 September 1990. 2) PHONECON, Howard K. Butler, with Mr. David Branham, Fielded Aviation Systems Directorate (FASMO), 26 April 1991.

²⁸⁹Briefing, Directorate for Engineering, Headquarters, AVSCOM, 16 November 1990.

1990.²⁹⁰ The response from MG Frix, ARCENT Forward, was both immediate and favorable,²⁹¹ and the main interest on this subject thereafter was to ensure that the 65 clamshells on contract to be delivered by 28 January 1991²⁹² did arrive in Saudi per agreement, which was 26 to the VII Corps and 36 to the XVIII Corps.²⁹³

MWO Equipment and Tools.

To add the MWO equipment, one needed all manner and number of tools, particularly special tools, and Saudi Arabia seemed to swallow them. The peculiarities of demands would amaze the layman; the AH-64, needed 19 tool sets to replace its rod end bearings.²⁹⁴ Certain aircraft, moreover, never had enough tools, such as the CH-47;²⁹⁵ the Deputy Commander, AVSCOM, reported in January 1991, that there was an ". . . exhausted supply of tools and test equipment for (the) CH-47."²⁹⁶

²⁹⁰Briefing, Fielded Aviation Systems Directorate, HQ, AVSCOM, 25 September 1990.

²⁹¹NDSC, 27 September 1990, notes cited.

²⁹²MSG, AMSAV-L-EOC, to the AMCOC-RE, 7 December 1990, subject: Clamshell Success.

²⁹³Memo, AMC-SWA, for the Director of Readiness, HQ, AMC, 19 December 1990, subject: SITREP #116, 19 December 1990.

²⁹⁴MSG, AMCOC-RE, to the DALO-LOC, 17 November 1990, subject: AMC SITREP No. 094.

²⁹⁵MSG, AMSAV-L-EOC, to the AMCOC-RE, 9 January 1991, subject: Tools and Test Equipment Required for Shipment.

²⁹⁶1) MSG, BG DeWitt T. Irby, Deputy Commander, AVSCOM, to the COMUSARCENT MAIN, 5 January 1991, same subject. 2) MSG, LTC Thomas R. Prickett, OIC, AMSAV-L-EOC, for COL Raines, G-4, Aviation, ARCENT, 31 January 1991, subject: Information Update.

Groupings of tools and work areas, called shop sets, were also much in demand. Luckily, the AVSCOM was completing the rearrangement of the current nine shop sets and the deletion, substitution, or addition of tools and equipment to said sets, as appropriate. Each of the sets' outward shapes was that of a shelter, which featured one expandable wall; the shelter was capable of operation in any climate and transportable via various modes.²⁹⁷

The first shipment of the nine-set grouping, or complex, was on "18 October (1990), from (the) AATD (Aviation Applied Technology Directorate, an AVSCOM activity located at Fort Eustis, Virginia) direct (sic) to Dover. (The) Shipment requires five 40' flatbed trailers. (The) Shop set is marked for (the) 24th Aviation Maintenance Battalion, F Company, C/O (Care of) TAMP-SA Forward."²⁹⁸ Three more sets followed in January 1991.²⁹⁹

In addition to the shop sets and special tools actions, sundry equipment exchanges or additions were constantly underway. A sampling of these were:

- shop vacuums - the AVSCOM bought 2,000 "shop" vacuum cleaners from Shop Vac, Incorporated, to suck up the ever-present sand and dust;³⁰⁰

²⁹⁷AVSCOM Research, Development and Engineering (RD&E) Center Report, FY 1990.

²⁹⁸MSG, AMSAV-L-EOC, to the AMCOC-RE, 17 October 1990, subject: (Operation Desert Shield).

²⁹⁹1) MSG, AMSAV-L-EOC, to the AMCOC-RE, 30 January 1991, subject: (Operation Desert Storm). 2) MSG, AMCOC-RE, to the AMSAV-L-EOC, 31 January 1991, subject: AMC SITREP No. 14 Operation Desert Storm.

³⁰⁰NDSC, 1 October 1990, notes cited.

- I-UMARKS - the AVSCOM developed a collection of items called the Interim Unit Maintenance Aerial Recovery Kits (I-UMARKS) which made it practicable to recover all Army helicopters using the rotor hub as the primary lift point and with all rotor blades attached.³⁰¹ Shipments of I-UMARKS kits were in transit by October 1990;³⁰²

- Rotor Analysis Diagnostic System - Advanced Technology (RADS-AT) - a prototype aircraft vibration analyzer (AVA) device, the RADS-AT underwent an expeditious metamorphosis into production form. The AVSCOM dispatched the six prototypes to Saudi Arabia and arranged for 30 more to follow by 15 November 1990;³⁰³

- Aviation ladders - the Fielded Aviation Systems Directorate bought 100 such ladders in October 1990;³⁰⁴

- Airfield Matting/XM-19 - the AVSCOM released 12 sets from Korean war reserves in October 1990 to abate the sand churned up by the blades of operating helicopters;³⁰⁵

- Modular Engine Test Set (MEIS) - a 1960's product, the MEIS offered a means for the Army to test its four major engine models - the T-53, T-55, T-63, and T-700 engines - at the Aviation Intermediate Maintenance (AVIM)

³⁰¹AVSCOM RD&E Center Report, FY1990, report cited.

³⁰²MSG, AMSAV-L-EOC, to the AMOOC-RE, 26 October 1990, subject: Aircraft Recovery Kits (U-MARKS) [sic].

³⁰³Historian, NDSC, 16 October 1990, notes cited.

³⁰⁴Historian, NDSC, 17 October 1990.

³⁰⁵MSG, AMSAV-L-EOC, to the AMOOC-RE, 7 October 1990, subject: Operation Desert Shield.

level. In November 1990, the AVSCOM made arrangements to ship a METS - an enormously heavy piece of equipment - to Saudi Arabia.³⁰⁶ The METS's successor, the Navy-developed Flexible Engine Diagnostic Test System (FEDS), was not ready for this war;³⁰⁷

- Engine test stands - the AVSCOM fed an enormous appetite for these stands; by mid-December 1990, there were over 1,600 in Southwest Asia;³⁰⁸

- the Personnel Locator System (PLS) - Fortunately, a "follow-on" production program for up to 10,700 more radios - with options - and 100 KY913/PRC-112 program loads was afoot to fulfill Aviation Life Support Equipment (ALSE) requirements for the AN/PRC-112 PLS. Advanced fielding to support Desert Shield took place,³⁰⁹ and, by late December 1990, 300 radios for the PLS were available and another 500 were on contract.³¹⁰

- and, mooring kits - the AVSCOM quickly rushed nearly a thousand of these items, with 4-inch anchors, to Saudi Arabia. The AVSCOM also began to take steps to obtain kits with 8-inch anchors.³¹¹

³⁰⁶MSG, AMCOC-RE, to the AMSAV-L-EOC, 27 November 1990, subject: Pass to AVSCOM.

³⁰⁷AVSCOM RD&E Center Report, FY 1990, report cited.

³⁰⁸Memo, MG Donald R. Williamson, CDR, AVSCOM, for MG Thomas G. Lightner, CG, United States Army Support Command (USASC), circa 21 December 1990, subject: Engine Test Stand.

³⁰⁹AVSCOM, RD&E Center Report, report cited.

³¹⁰MSG, AMSAV-L-EOC, to the AMCOC-RE, 23 December 1990, subject: (Operation Desert Shield).

³¹¹MSG, CDR, XVIII Airborne Corps, to the CDR, AVSCOM, 3 November 1990, subject: Mooring Kits.

Defense to Offense: Enter the VII Corps

Background

As the preceding pages indicate, the AVSCOM had, by early November 1990, a rather complete programme of aviation logistics support for Southwest Asia in operational order. The AVSCOM's main concerns seemed to be the continuance of its exaggerated support to Southwest Asia³¹² and the execution of those refinements deemed necessary to improve that support. Not all of the latter were the products of AVSCOM notions, for one of the more important emanated from the ARCENT:

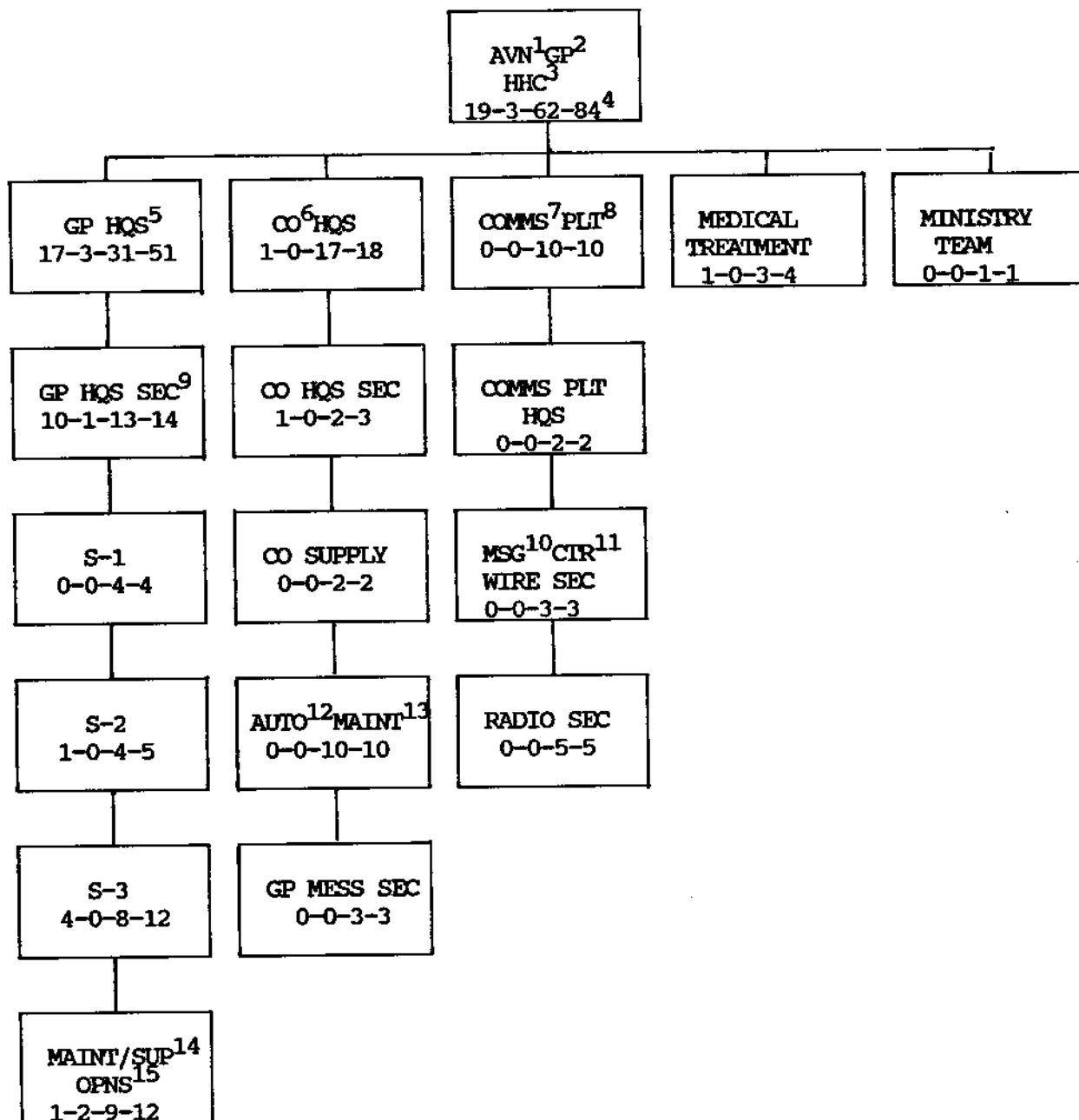
"Due to the concern for Aviation Safety and Standardization, we are considering establishing an ARCENT Aviation Element. Phase 1 would require (the) build-up of the Aviation Section in ARCENT G-3 (sic) and Phase 2 would entail the fielding of an echelon above corps aviation organization. This organization would provide continuity of policy and operations and minimize the degradation in aviation safety, standards, and operational (sic) ready ratios."³¹³

³¹²Epitomized, for example, in a lengthy status report by the Commander, AVSCOM, to the CDR, 101st Airborne Division, on everything from special tools for the AH-64 to the Rotor Blade Tip Cap Program: MSG, MG Donald R. Williamson, CDR, AVSCOM, to BG Adams, CDR, 101st Airborne Division Forward, 11 December 1990, subject: Aviation Sustainment Issues.

³¹³MSG, BG R.S. Frix, CS, ARCENT FORWARD, for MG Taylor, ARCENT REAR, (25 October 1990), subject: ARCENT Command SITREP as of 25 October (C+79).

The next day, BG Irby, the AVSCOM Deputy Commander, endorsed BG Frix's suggestion. BG Irby noted that the ARCENT needed a structure as that of the 34th General Support Group in Vietnam,³¹⁴ and he offered BG Frix an outline of an organization which, if he would try it, he would " like it.":

³¹⁴For more on the formation of the 34th, see Butler, Army Aviation Logistics and Vietnam, opus cited, pp. 72-79.



¹Aviation

²Group

³Headquarters and Headquarters Company

⁴That was, 19 officers, 3 warrant officers, and 62 enlisted men, or 84 military personnel in total.

⁵Headquarters

⁶Company

⁷Communications

⁸Platoon

⁹Section

¹⁰Message

¹¹Center

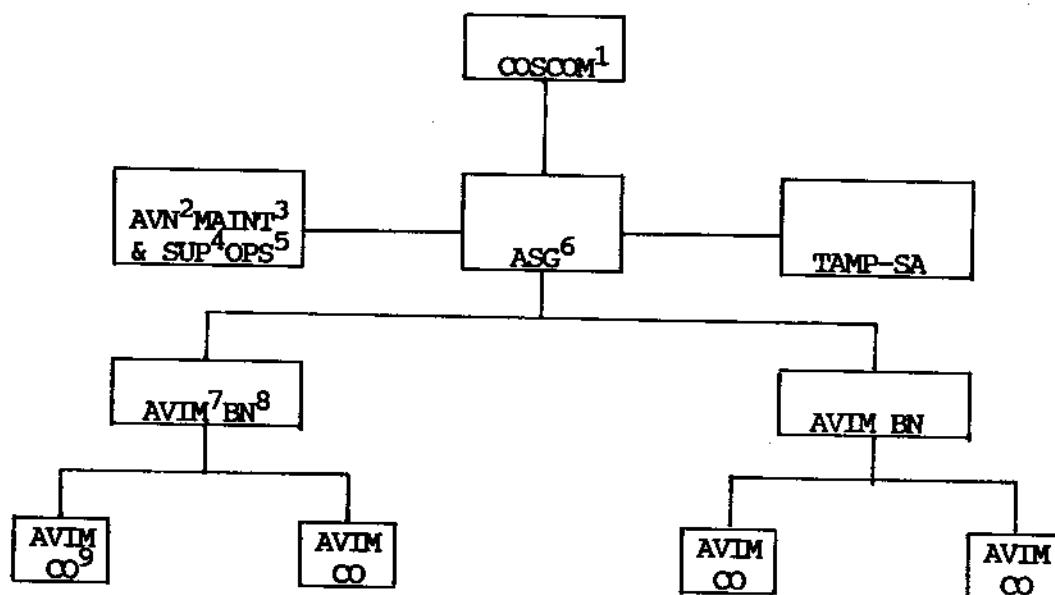
¹²Automotive

¹³Maintenance

¹⁴Maintenance and Supply

¹⁵Operations

This aviation support group would appear thusly in the overall structure in Southwest Asia:



¹Combat Support Command

²Aviation

³Maintenance

⁴Supply

⁵Operations

⁶Aviation Support Group

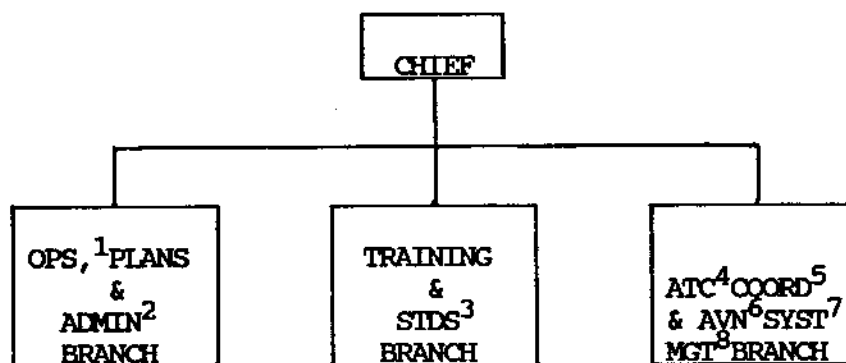
⁷Aviation Intermediate Maintenance

⁸Battalion

⁹Company³¹⁵

³¹⁵Ltr, BG DeWitt T. Irby, Dep Cdr, AVSCOM, to BG R. S. Frix, CS, ARCENT FWD, 26 October 1990, subject: Aviation Support Group.

The Office, Deputy Chief of Staff for Operations (ODCSOPS), next took its whack at the proposition, envisioning a command and control structure featuring an aviation battalion headquarters, an aviation support group headquarters, a theater aviation and materiel management element in the support command, and an aviation maintenance battalion headquarters (Aviation Intermediate Maintenance). The ODCSOPS plan schematically showed an ARCENT G-3 aviation division



¹Operations

²Administration

³Standards

⁴Air Traffic Control

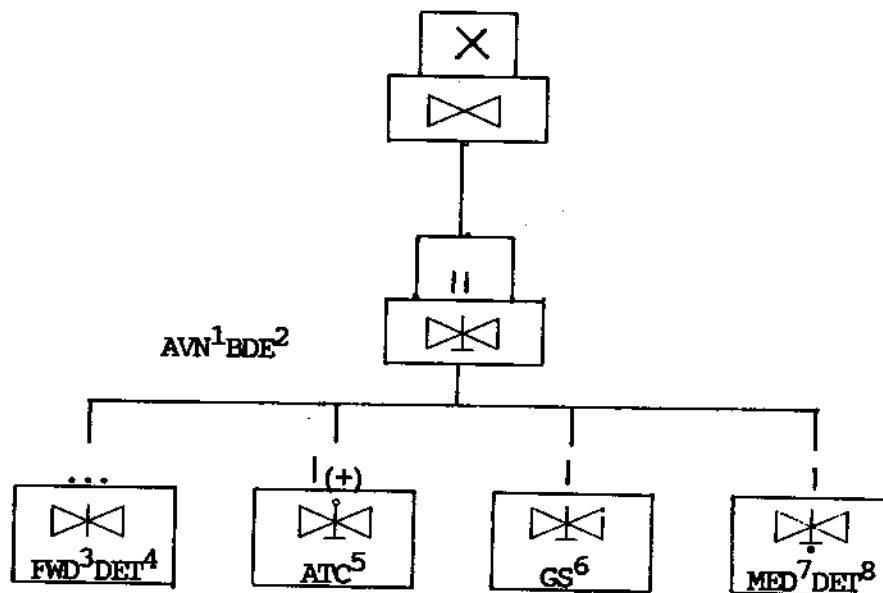
⁵Coordination

⁶Aviation

⁷Systemization

⁸Management

. . . . an Echelons Above Corps (EAC) aviation brigade



¹Aviation

²Brigade

³Forward

⁴Detachment

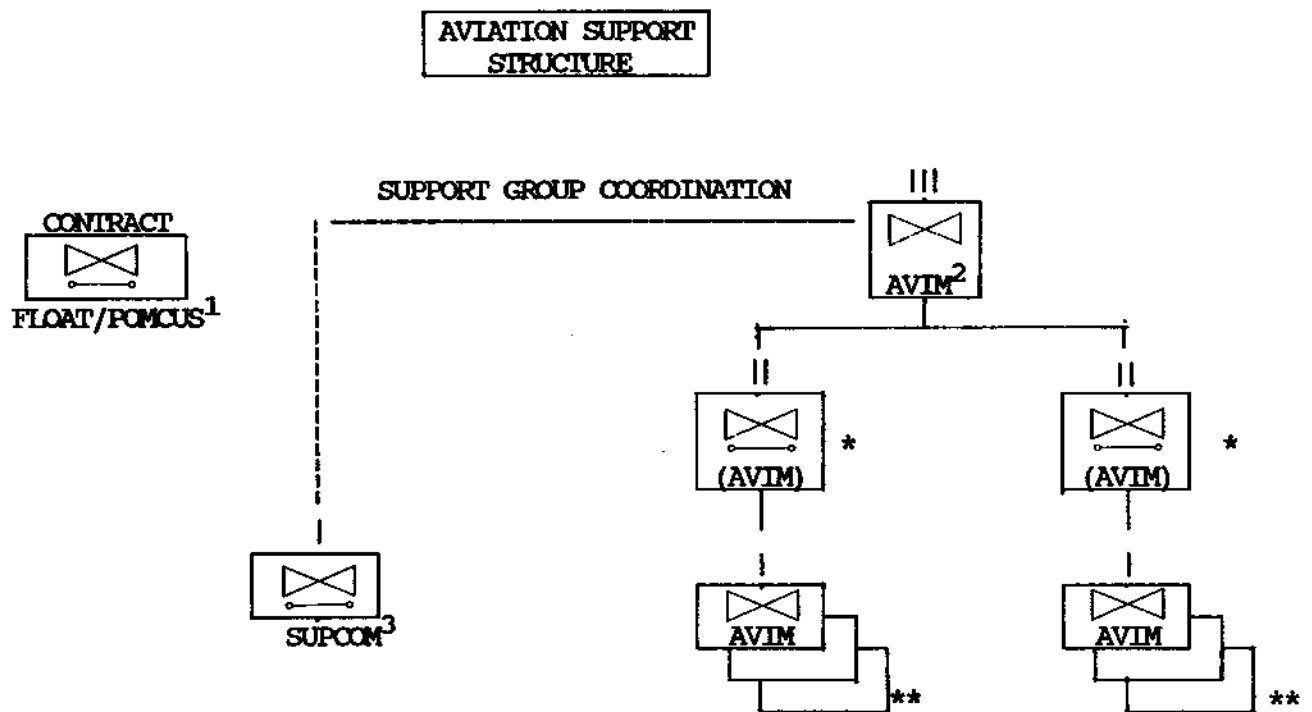
⁵Air Traffic Control

⁶General Support

⁷Medical

⁸Detachment

. . . . and, at long last, an overall glimpse of the whole



¹Prepositioning of unit equipment configured to unit sets, that was, a reserve.

²Aviation Intermediate Maintenance

³Support Command

*Rotational Battalion Headquarters

**Rotational AVIM Companies

The ODCSOPS concluded that an aviation battalion headquarters at EAC was necessary " to command and control all companies and detachments not assigned to corps (and to) pull together (an) array of diverse functions that are essential in an operational theater.." Further, the aviation support group would replace an ad hoc organization currently commanding and controlling, and, finally, the theater aviation maintenance element in the SUPCOM would "establish policy for the theater, provide theater level supply and maintenance, coordinate contractor support, and provide interface with all supply activities external to the theater."³¹⁶

The VII Corps Arrives

When the VII Corps began to make preparations to relocate part of itself to Saudi Arabia after the President's 8 November 1990 decision to fashion an attack force, the AVSCOM had, in principle, only to expand its already established processes. The VII Corps, however, would prove intractable to the command's offerings. From start to finish, that corps did not understand or attempt to cooperate with the workings of the aviation logistics.³¹⁷ Consequently, the AVSCOM was unable to satisfy the VII Corps on any score.

The difficulty with the VII Corps began innocently. After three months of logistical concentration upon Southwest Asia, the VII Corps had, as had other Army elements elsewhere, begun to suffer in this sphere, and, moreover, certain

³¹⁶MSG, ODCSOPS (DAMO-FDV), to the DCG, AVSCOM, circa 31 October 1990, subject: Draft Concept Plans: Army Aviation Support Structure at ARCENT Level.

³¹⁷Historian, NDSC, 4 April 1991. Writer's Note: This sentence is a very, very mild paraphrase of BG Irby's remarks.

preparations were in order. The VII Corps' first letter of 15 November 1990, was, therefore, a commonplace, a list of wants. Chief among these were:

- 42 of 67 UH-1Hs needed particle separators.
- there were neither particle separators nor AVIM tools for 16 of its CH-47s.
- and, its 45 AH-1s needed particle separators.³¹⁸

The AVSCOM's prompt response took worldwide shortages into account. For the USAREUR's triad it noted, respectively, that there were insufficient separators available for UH-1Hs prior to deployment, and that the USAREUR should accordingly shift protected aircraft to deploying units; that there were sufficient AVIM tools for the CH-47Ds, but that their particle separators would not be ready until late December; and lastly, that the first 20 AH-1 particle separators, and tools to install them, would be available 26 November 1990. The AVSCOM also added that extended range fuel systems (ERFSs) for the CH-47Ds, a subject of some discussion later - would, when available, be earmarked for Desert Shield units.³¹⁹

The VIIth's counter was another, longer list. Its additions included non-divisional shop sets, air-to-air-stinger (ATAS) missiles, OH-58Ds, M43 Aviator Masks, the AN/APR-39A (V1) Radar Warning Receiver, the AN/ALQ-162 Radar

³¹⁸MSG, Commander-in-Chief, United States Army, Europe (CINCUSAREUR), Zweibrucken, Germany, to the CDR, AVSCOM, 15 November 1990, subject: USAREUR Aviation Concerns for Desert Shield.

³¹⁹MSG, AMSAV-L-EOC, to the CINCUSAREUR, Zweibrucken, Germany, 18 November 1990, same subject.

Countermeasure Set, and so forth.³²⁰ This provoked two AVSCOM answers, the first a message from the Emergency Operations Center³²¹ and a multi-page letter from the Commander, AVSCOM, which enclosed point papers, or precis, on every imaginable aviation logistics subject of current concern, particularly ASE fielding schedules.³²² The general followed his epistle with a trip to Germany, where he discussed all ten major USAREUR concerns.³²³

All to no avail. The VII Corps letters continued, and the "laundry list" of wants only grew. By December, its non-divisional AVIM apparently could not support any aircraft or auxiliary system - the AH-64, the OH-58D, the ATAS missiles, and so on - and it had serious deficiencies of all manner of peculiar tools and authorized stockage list items.³²⁴ A month later, the non-divisional AVIM became more than a concern; the VIIth's " non-divisional AVIM support capacity is not sufficient to perform assigned missions." Nor, apparently, could it sustain its "MEDIVAC" (sic) helicopters.³²⁵

³²⁰Ltr, CINCUSAREUR, Heidelberg, Germany, to the COMUSARCENT MAIN, Riyadh, Saudi Arabia, 20 November 1990, subject: VII Corps Southwest Asia Deployment.

³²¹MSG, AMSAV-I-EOC, to the CINCUSAREUR, Heidelberg, Germany, 3 December 1990, subject: USAREUR Deployment and Modernization Sustainment Concerns.

³²²Ltr, MG Donald R. Williamson, CDR, AVSCOM, to the CINCUSAREUR, 3 December 1990, same subject.

³²³Memo, LTC Lynn S. Hansen, AMSAV-I-EOC, for COL Raines, ARCENT Aviation G-4, 3 December 1990, subject: Discussion Topics for MG Williamson.

³²⁴MSG, CDR, VII Corps, Moehlingen, Germany, to the CDR, ARCENT SUPCOM, Saudi Arabia, 9 December 1990, subject: Critical Mission Equipment for 7-159th Aviation Regiment.

³²⁵Fact Sheet, BG James W. Monroe, ARCENT J-4/Deputy for Host Nation Support, 16 January 1991, subject: VII Corps AVIM Support.

Nevertheless, the VIIth asked for more; in January 1991, it requested an Army Oil Analysis Program (AOAP) laboratory,³²⁶ which underwent shipment on 29 January 1991,³²⁷ even though the XVIIIth, the other corps in the zone, had never requested one.³²⁸

All of this hurly-burly did produce several AVSCOM command responses. The Commander, AVSCOM, took a patient tack in these, offering fatherly counsel to the VIIth on the machinations of the supply system:

"1. Our Aviation Parts for VII Corps is (sic) dependent on good communications and responsive transportation. We need to make sure we have a streamlined process and understand the segments so we can monitor, measure and spot the problems and resolve them quickly.

"2. The requisition flow for aviation AIMI and AOG (Aircraft Grounded for Parts) should go from the 7/159 AVIM thru (sic) the 321st MMC to AVSCOM. This can be accomplished manually, electronically, (or by) fax. The majority of the parts will be released from over 60,000 parts stocked in UAE, and

³²⁶MSG, AMSAV-L-EOC, to the AMCOOC-RE, 1 February 1991, subject: AOAP Support for VII Corps.

³²⁷1) MSG, AMCOOC-SM, HQ, AMC, to the ARCENT Support Command, 2 February 1991, same subject. 2) MSG, CDR, Materiel Readiness Support Activity (MRSA) to the AMCOOC-SM, HQ, AMC, 4 February 1990, subject: Army Oil Analysis Program (AOAP) Support for Southwest Asia and VII Corps.

³²⁸FAX, COL Raines, ARCENT G-4, for the AVSCOM, 8 February 1991, subject: ARCENT G-4 Update.

transported daily by air to Dhahran and KKMC. Those on hand in UAE will be direct shipped via Desert Express. I don't have a good number, but items at UAE should be provided to you in about 3 days, and perhaps a few more if we direct ship from CONUS.

"3. Replenishment 9BU requisitions go from the 7/159 direct to CONUS NICP's. (sic) These normally process through Tinker or Dover ALOC's. (sic) Class IX Repair Parts are near (sic) last in the ARCENT priority list, however, and coupled with ALOC backlog, it may take weeks for replenishment spares.

"4. So, if you need to track the AOG and AIMI and make sure the requisitions get through the 321st and to AVSCOM, I need to look for the AIMI and AOG requests and make sure we are getting same day releases and track the inventory to lift off. From the (sic) point it's (sic) a theater distribution problem, and I suggest that COL Johnny Hitt have a rep (sic) at Dhahran and KKMC to look after your interest. Hopefully, this has shed some light on the "process," so we can monitor and refine to insure we have a smooth flow of aviation parts.

"5. We have also pushed 15 days of AIMI and some battlefield spares forward to KKMC to give you all (a) kick start to overcome some of the recent problems we've encountered.

"6. Please let me know if you are not getting aircraft parts, especially AIMI and AOG. We'll do our best to break any log jam."³²⁹

Fatal final entreaty! The VIIth continued to let him know - in many ways. It supplied, by major corps element, the percentage of "zero balance" Class IX ASL stocks, with a separate division of aviation parts;³³⁰ it continued to forward shortage lists from its major elements;³³¹ and, au contraire to paragraph two in General Williamson's 28 January 1991 letter, it stated that, when it arrived in Saudi, it had " . . . over 700 lines zero balance and have (sic) used a lot of the rest . . . " because its late arrival meant that it only had a manual data input capability, but " . . . AVSCOM and AMC wanted only automated input." The VIIth concluded that, after over two months in theater, the parts support " . . . system (was) still not working as (it) should.",³³² and, further, it was not working despite the VIIth's most vigilant endeavours:

³²⁹MSG, MG Donald R. Williamson, CDR, AVSCOM, to the CDR, VII Corps, Moehringen, Germany, 28 January 1991, subject: Aviation Parts Support.

³³⁰Writer's Note: Aviation parts had a higher percentage in four of the seven elements: FAX, USARCENT MAIN, Riyadh, Saudi Arabia, to the CDR, AVSCOM, 4 February 1991, subject: VII Corps Class IX ASL Status.

³³¹MSG, CDR, 1st Cavalry Division Forward, to the CDR, VII Corps Forward, 5 February 1991, subject: Aviation Maintenance.

³³²MSG, CDR, VII Corps, to the AMSAV-L-EOC, 4 February 1991, subject: Aviation Parts Support.

"5. We have physically had eyes on VII Corps cargo, in particular Desert Express, at all APODs (Aerial Ports of Debarkation). A team from both the Corps Movement Control Center and Materiel Management Center has been in place (sic) at Dhahran since December, and at KQMC for 3 weeks to ensure timely in-country processing of all aviation parts as they are received. Aviation parts are flown by C-130 or CH-47 to the corps area when received in theater

"7. With respect to fill of 7/195's ASL shortfall, we appreciate the offer of a special air mission to preclude further delay in fill. While the reconciliation of manual to machine records takes place, recommend you provide immediate fill of all requisitions active for DODAAC's (sic) your automated systems people can probably identify these requisitions quickly and get fill on the way. Some of these requisitions are quite old since we left Germany with over 700 lines at zero balance and have used a considerable amount of the remainder. You may recall from your visit with us in Germany that some of these problems

are of long standing and were addressed to you
at that time. (We are) Pleased that they can be
resolved."³³³

In the meantime, vis-a-vis aviation Class IX parts, " some systems
are not available except from repaired assets."³³⁴

Transportation

In mitigation of the alleged culpability of either the VII Corps or the
AVSCOM was one factor beyond their control - transportation. The VIIth was
simply unlucky; in December 1990, when its deployment to the zone of operations
was at its height, the transportation system, already taxed by the XVIIIth's
demands, simply snarled. Thereafter, no matter what the AVSCOM might do, it
remained tangled - and thoroughly so, as these five categories indicate:

³³³MSG, CDR, VII Corps Rear Forward, to MG Donald R. Williamson, CDR, AVSCOM,
5 February 1991, subject : Aviation Parts Support.

³³⁴MSG, COMUSARCENT MAIN, to the AMCOC-RE, et alia, 5 February 1991, subject:
Logstat Report/No. 153.

<u>Area and Problem</u>	<u>Month Problem Began</u>	<u>Problem Status</u>
I. Depot MRO ¹ Processing - Extensive Delays		
- LBAD ² - Closing	October	Continuing
- RRAD ³ - Transportation Backlog	December	Continuing
- NCAD ⁴ - Receipt Processing Backlog	December	Continuing
- NCAD - COCP ⁵ Delays	November	Continuing
- COCP Rejection of Other Than Class A/A Packing	October	Continuing
II. Desert Shield Clearance Delays of a Week or More, from Vendors to Desert Express	December	Continuing
III. APOD ⁶ Delays (Tinker or Dover) of a Week or More	December	Continuing
IV. Abu Dhabi-Bound Materiel Shaghied at Dhahran	November	Continuing
V. Diversion of Air Freight to Surface From Charles Towne and Other Points	January	Continuing

¹Materiel Release Order

²Lexington-Blue Grass Army Depot, Lexington, Kentucky

³Red River Army Depot, Texarkana, Texas

⁴New Cumberland Army Depot, New Cumberland, Pennsylvania

⁵Customer Order Control Point

⁶Aerial Point of Debarkation³³⁵

³³⁵Fact Sheet, Staff Conference, 23 January 1991.

As mentioned earlier, the culprit was not the Army Air Corps, which oft received the plaudits of the Commander,³³⁶ but rather the ground forces' own bureaucracy, closely aided and abetted by that of the Defense Logistics Agency.

The former, the commander periodically declared, continued to conduct " . . . business as usual " emergency or no.³³⁷ All three of its elements were, plainly put, obstacles to the conduct of the war. In order these were:

- one, the requisition system itself. Briefly put, items and equipment moved from point a to point b despite the system, not because of it. The automation of this system, which had required over 30 years to effect, had produced only adversities and a major worry for the commander;³³⁸

- two, the Logistics Clearance Authority in San Francisco, which seemed to take perverse pleasure in cargo "frustration." Slow or uncertain responses, delights at finding un-crossed "t"s, and just an all-around obduracy were trademarks of its operations. Stimulated by the constant complaints of his subordinates about that agency, the commander himself tried once to obtain a telephonic contact. Seven telephone calls, stretching from late afternoon until after midnight, ensued. Busy signals, unreturned calls, the unavailability of the responsible parties, and, finally, a statement that "You're too late now. You'll have to try again tomorrow (that was, today, already)." - were the results;³³⁹

³³⁶Historian, NDSC, 14 December 1991.

³³⁷1) Historian, NDSC, 13 February 1991. 2) Historian, NDSC, 21 February 1991.

³³⁸Historian, NDSC, 22 April 1990

³³⁹Historian, NDSC, 13 December 1990.

- and, three, the actual movement of cargo from points of origin to shipment locations. The principle obstructions along these many routes were the depots and, among these, the worst was New Cumberland. In late January 1990, New Cumberland opened a new facility. Before this, it handled 70 trucks per week; now it handled 20. In the first week of February, New Cumberland actually sent 70 trucks back while it began clearing a processing backload.³⁴⁰

Cargo that somehow made it to the three aerial ports - Tinker Air Force Base (AFB), Dover AFB, or Charles Towne - was not necessarily soon aloft. If it did not have the proper clearance, there was an arbitrary re-routing to either surface shipment or, in the case of Charles Towne, sometimes to Dover or Tinker.³⁴¹ Two more delaying factors then came into play - one, short term, was the assignment of first priority to Christmas mail;³⁴² the other was the relegation of Aviation Class IX parts to 13th or 14th in a priority list of 15 or 16. This latter situation did not improve until 29 January 1991, when Class IX vaulted into second place, trailing only Nuclear-Biological-Chemical (NBC) gear.³⁴³

³⁴⁰Historian, NDSC, 7 February 1991.

³⁴¹Historian, NDSC, 15 January 1991.

³⁴²MSG, AMLOC-RE, to the AMSAV-L-EOC, 11 December 1990, subject: (Extract from AMC-SWA 108 of 11 December). Writer's Note: The same message also noted a problem with in-theater transportation between Dhahran and Abu Dhabi.

³⁴³Historian, NDSC, 29 January 1991.

Perhaps the AVSCOM Commander had some place in this revision, per this message of his two weeks before relief:

"We've (the AVSCOM) had ALOC (Air-Line-of-Communication) (Cargo) diverted to surface and Desert Express (a special Air Corps means of shipment to Saudi Arabia, to be discussed later) diverted to ALOC and surface. One of the problems is ARCENT priority where (sic) Class IX is dead last. Suggest you review and see if this is really what you want. As a minimum, I recommend you move up the priority for aviation and 9AU (a description code for the following acronym) AOG (Aircraft on the Ground)."³⁴⁴

By this time, though, the combination of "frustrated" cargo and low priority made cargo pile-ups at APODs inevitable. Already by 28 November 1990, there was enough cargo awaiting at Dover to fill nine C-5s³⁴⁵ and enough at Tinker for eight.³⁴⁶ By 12 December, these mountains were larger, or 32 C-5 loads taken together.³⁴⁷ With the depressing Class IX priority still in

³⁴⁴MSG, MG Donald R. Williamson, CDR, AVSCOM, to the COMUSARCENT MAIN, 15 January 1991, subject: Class IX Transportation Priorities.

³⁴⁵Writer's Note: A C-5 airplane's maximum cargo capacity was 261,000 pounds, or about ample for either two M-1 tanks or six AH-64 Apaches. See: Editor, Janes All The World's Aircraft, 1986-1987, Janes Publishing Company, Limited, London, 1986, pp. 443-444.

³⁴⁶Historian, NDSC, 28 November 1990.

³⁴⁷Historian, NDSC, 12 December 1990.

effect more than a month later, the commander could, with almost certainly intended understatement, state that, "Transportation (was) becoming a big hole."³⁴⁸

The hole yawned even wider, until at last it girded the globe. Ten thousand miles away, as mentioned very early in this text, a Vietnam style snarl of its own was a-building in Dhahran. Thanks to that modern marvel, the computer, to the confused resuscitation of a regimental system, and to all of the bureaucracy preceding writ small in the zone, the commander could, in late January, speak of "another Long Binh" and of a "big black hole" at the Army support group there.³⁴⁹

Competition

As the shipment straits for Saudi strangled from the surfeit of supplies, the moans of the unsatiated elsewhere began to become noticeably louder. By late November 1990, the Commander, Forces Command (FORSCOM), reported that . .

"Available shipping to Saudi Arabia for Operation Desert Shield remains constrained due to competing CONUS (Continental United States)/European requests. The FORSCOM (continues to maintain) priority for Desert Shield surface movements in Phase II units."³⁵⁰

³⁴⁸Historian, NDSC, 15 January 1991.

³⁴⁹Historian, NDSC, 24 January 1991.

³⁵⁰MSG, CDR, FORSCOM, to the AMSAV-L-EOC, et alia, 26 November 1990, subject: Priority Movement of Operation Desert Shield Phase II Units.

For how long? Ten days earlier, the HQ, AMC, declared that several Training and Doctrine Command (TRADOC)³⁵¹. . . .

" installations are reporting that nonavailability of repair parts is beginning to have an impact on sustaining training base equipment. Fort Benning is reporting (a) delay in obtaining repair parts to sustain (its) M2/M1.3/M92 fleet. Fort (underscore message's) Rucker is reporting that (a) lack of repair parts is starting to affect their (sic) helicopter training fleet."³⁵²

With the deployment of the VIIth, the overall aviation logistics situation of any command outside of the zone of operations could only worsen. The fault lay not with the AVSCOM; pre-commitment funding precluded the establishment of sufficient war stocks to sustain any large-scale overseas operations. The decision to maintain the air fleet in the desert at abnormally high readiness rates only exacerbated the AVSCOM's support burdens. Hence, even though, at its zenith, only about 21 percent of Army aircraft were in Saudi Arabia, the remaining 79 percent had to become semi-dormant. A lengthy, and costly, Vietnam-style air war would have, within less than two months, entailed some serious logistical discussions among, and some hard decisions by, the most senior political and military leaders concerned.

³⁵¹The Army's three major field commands were the AMC, for logistics; the FORSCOM, for handling troops; and the TRADOC, with a self-explanatory designation.

³⁵²MSG, AMCOC-RE, to the AMSAV-L-EOC, et alia, 16 November 1990, subject: TRADOC SITREP No. 12-16 Nov (sic) 90 (sic) (p.2).

AVSCOM Measures

Preliminary

The AVSCOM commander might suggest, he might recommend, and he even might entreat, but, against the array of a stunted and stultified logistical scheme, the most consistently satisfying course he could take would be to persist. Somehow, perhaps, if enough items and equipment were enroute, if enough representatives were in country, and if enough of endless other measures were taken to excess, the Army air fleet in Saudi Arabia could operate efficiently. The commander, and the command, did persist, not only with those measures already at full function, but with a number of steps a-developing or as yet only a thought. These actions did not specifically take aim at the VII Corps, which would soon be in a bitter rivalry with the XVIIIth,³⁵³ but attempted to be equitable for each.

Float

A float plan, that is, one for reserve aircraft to use while assigned aircraft were undergoing repairs, began to take form at the Headquarters, DA, as early as mid-October 1990.³⁵⁴ The AVSCOM's answer, as our reader might now painfully guess, was Team Float,³⁵⁵ but, with the movement of the VIIth, the command had to place this action in abeyance. After the turn of the year, the Commander, AVSCOM, revived both the notion and some specifics:

³⁵³Writer's Note: Even to the point of a free-for-all-fist-fight about supplies. See: Historian, NDSC, 14 January 1991.

³⁵⁴MSG, CINCFOR, Fort McPherson, Georgia, to the ARCENT MAIN, Riyadh, Saudi Arabia, 19 October 1990, subject: Aviation Issues from ARCENT SUPCOM LOGSITREP Number 41.

³⁵⁵Historian, NDSC, 26 October 1990.

"1. With the deployment of Army aviation to Desert Shield, (the) AVSCOM (,) in conjunction with (the) ARCENT), (the) ODCSOPS and (the) PEO Aviation identified a number of aircraft for movement to Southwest Asia for (the) establishment of an aviation float account. The consensus was that without such a capability, sustainment of readiness objectives would be adversely impacted. Initially this support had adequate priority to gain access to air shipment direct (but) with the November plus up of forces we refer to as "Desert Shield II" all priority for (the) shipment of float was lost (we) need ARCENT priority

"3. We currently have 7 AH64, 2 EH60, 2 UH60L and 5 UH-1, (all five) (sic) at CCAD awaiting movement to Southwest Asia. In addition, we have 7 AH1F models marked for swapout of (sic) AH1E models currently in Southwest Asia"356

Although the agreed-upon float percentage was 10, there was a

" shortfall of eleven (11) AH-64, five (5) AH-1, thirteen (13) OH-58C, three (3) OH-58D, four (4) UH-60, one (1) EH-60, and twenty-four (24) UH-1 aircraft (which,) from my (the) AVSCOM

³⁵⁶MSG, MG Donald R. Williamson, CDR, AVSCOM, to the COMUSARCENT MAIN, et alia, 5 January 1991, subject: Prioritization of Airlift/Support for Float.

Commander's) perspective, is unacceptable.
This becomes especially crucial in view of the fact
that some of the aircraft float already in theater
have been used to fill TOE (Table of Organization and
Equipment) shortages "

"3. My second concern is the priority by which ready-
for-issue (RFI) ORF assets are being called forward by
(the) ARCENT. Currently, these are 4 AH-1F, 2
AH-64s, 5 UH-1s, and 2 EH-60s awaiting transportation
. . . . since 7 January at (the) CCAD (Corpus
Christi Army Depot)."³⁵⁷

In brief, the ARCENT perverted the float by use of its assets as merely
more airplanes. Accordingly, while the AVSCOM might draw up, and secure
ODCSOPS approval for, a comprehensive float for SWA

³⁵⁷MSG, MG Donald R. Williamson, to the CDR, AMC, 16 January 1991, subject:
Identification and Shipment of Operational Readiness Float (ORF)/Reserve
Readiness Float (RRF) in Support of Desert Shield.

		ODCSOPS	IN
<u>Aircraft</u>	<u>10%</u>	<u>Approved</u>	<u>AOR</u> ¹
Total	175 ²	144 ³	166 ⁴
AH-1E	1	1	50
AH-1F	14	8	7
AH-64	25	34	34
CH-47D	15	16	0
OH-58C	33	17	7
OH-58D	9	18	8
UH-1H	36	20	30
UH-60	39	28	28
EH-60	3	2	2

¹Area of Responsibility, that was, the war zone.

²Mistakenly shown in original as 173.

³Mistakenly shown in original as 143.

⁴Mistakenly shown in original as 167.³⁵⁸

. . . . said float got swallowed by the ARCENT.³⁵⁹

Retrograde/RX/DX

A commonplace of standard logistics practice was the circular flow of supplies and equipment, that was, the point to be supplied was not, in theory, a maw; excess, unneeded, and repairable items and equipment were to return - in

³⁵⁸Historian, NDSC, 25 January 1991.

³⁵⁹Amounting to 140 aircraft shipped by 20 February 1991. See: Historian, NDSC, 20 February 1991.

a word, retrograde. Naturally, the AVSCOM had a TEAM RETROGRADE, which was to do business with the 149th COSCOM in the AOR for ordinary items and equipment³⁶⁰ and with the 249th Repair Parts Company at King Fahd Air Base for ADMI.³⁶¹

King Abdul Aziz Air Base, just north of Dhahran, was the initial retrograde collection point. Retrograde was a serious concern of the AVSCOM Forward,³⁶² for, in mid-October 1990, that base lacked sufficient handling equipment and personnel for the retrograde mission. The AVSCOM offered to assist with men and with facilities for classification, palletization, and transportation,³⁶³ and, by 23 October 1990, it had an In-Country Retrograde Plan completed.³⁶⁴ Retrograde, however, proved to be an AVSCOM concern only, and therefore it did not become an issue of moment.

Without a functional retrograde program, the auxiliaries of retrograde, the direct exchange and repairable exchange (DX/RX), could not properly function, for little was returning from the theater. Accordingly, while the AVSCOM might take such steps as the dispatch of DX/RX spares to the TAMP-Forward³⁶⁵ the net of a one-command exertion was failure.

³⁶⁰NDSC, 3 October 1990, notes cited.

³⁶¹MSG, AMCOC-RE, to the AMSAV-L-EOC, et alia, 5 October 1990, subject: AMC-SWA SITREP 45, 5 October 1990.

³⁶²NDSC, 9 October 1990, notes cited.

³⁶³MSG, BG DeWitt T. Irby, Deputy Cdr, AVSCOM, to the CDR, XVIII Airborne Corps Forward, 19 October 1990, subject: Aircraft Readiness Initiatives for Desert Shield.

³⁶⁴NDSC, 23 October 1990, notes cited.

³⁶⁵NDSC, 28 December 1990, notes cited.

Desert Express/Camel Express

The lack of returns placed a great emphasis upon the AVSCOM as an issue. Here, as recent pages suggest, the critical issue was neither the procurement nor the acquisition of parts and equipment, but rather the delivery of said subjects from the factory to the front. On 19 October 1990, the AVSCOM married one of its first great ideas, aircraft-on-the-ground (AOG), that was, a part without which an airplane could not fly, with another - Desert Express. Desert Express involved the departure, at two o'clock in the afternoon, of a C-141 cargo airplane from Charles Towne for a direct, non-stop, 10-hour flight to Dhahran. Desert Express's emphasis was to be " things, not tons," that was, critical cargo,³⁶⁶ The AVSCOM intended to feed the daily flight from three sources - the National Guard's airplanes, commercial air, and the Regular Army's small airplanes. The C-141 was to have 10 pallets - five for the Army, four for the Air Corps, and one for the Navy.³⁶⁷

On Monday, the 29th of October, 1990, the Army had 3,100 pounds of cargo waiting for the first Desert Express Flight.³⁶⁸ It arrived on schedule, its three pallets contrasting with the 12 to 13 that C-141s normally carried. One of the pallets contained medical supplies³⁶⁹ while the rest consisted mostly

³⁶⁶Historian, NDSC, 19 October 1990. The Air Corps, noting the AVSCOM's heavy use of commercial flights, advanced the express as a substitute.

³⁶⁷NDSC, 24 October 1990, notes cited. Writer's Note: There was, once again obviously, a TEAM EXPRESS.

³⁶⁸Historian, NDSC, 29 October 1990.

³⁶⁹Writer's Note: Desert Express' Army portion meant the whole Army, not just the AVSCOM.

of AIMI.³⁷⁰ The next day, the C-141 left with a pallet-and-a-half laden with 2,400 pounds of cargo, 2,300 of which pertained to the Army.³⁷¹ By November the 14th, the 16th flight, the Desert Express was carrying 16,495 pounds of cargo, of which 10,773 were Army and 3,973 were AVSCOM. AVSCOM items included starters, engines, and assembly pumps.³⁷²

The rising volume did not entirely please the AVSCOM Commander. On 7 November 1990, the Army had assigned Desert Express Code 9AU,³⁷³ and, in the commander's mind, and therefore inevitably in the minds of others, as well, 9AU, Desert Express, and AOG became inextricably linked.³⁷⁴ Each Desert Express flight cost \$116,000 - the Army's share was \$48,333, and the commander wanted to be sure that the outbound cargo was, at an average cost of \$3.13 per pound, full of critical items. He therefore wanted pieces totaled;³⁷⁵ and so, for example, the log for the 27th flight on Sunday, November the 25th, 1990, duly noted that the AVSCOM's portion of 6,099 pounds consisted of 49 pieces, 15 of which were AOG.³⁷⁶

³⁷⁰MSG, AMCC-RE, to the AMSAV-L-EOC, et alia, 1 November 1990, subject: AMC-SWA SITREP 72, 01 November 1990.

³⁷¹Historian, NDSC, 31 October 1990.

³⁷²Historian, NDSC, 15 November 1990.

³⁷³Historian, NDSC, 7 November 1990.

³⁷⁴Writer's Note: The connexion became tighter on 26 December 1990, when the commander directed that all 9AU cargo pass through Charles Towne. See: Historian, NDSC, 26 December 1990.

³⁷⁵NDSC, 14 November 1990, notes cited.

³⁷⁶Historian, NDSC, 26 November 1990.

The Desert Express expanded on 31 January 1991 to two daily flights.³⁷⁷ Earlier, on 15 January 1991, King Khalid Military City (KKMC) had received an address, or DODAAC, and the commander wanted the Desert Express to stop there, as well as at Dhahran.³⁷⁸ The express did begin to serve KKMC on 13 February 1991.³⁷⁹ The two express flights persisted throughout the crisis and beyond, and the AVSOM continued to supplement these special shipments with, as it deemed necessary, commercial carriers, such as Lufthansa,³⁸⁰ Federal Express,³⁸¹ and DHL.³⁸²

Internal air transportation in Saudi Arabia, or Operational Support Airlift (OSA), was, again per the example in Vietnam, both an assumed need since the decision to deploy and a heavily-dependent-upon-a-contractor affair. Beech Aerospace Services, Incorporated (BASI), was the selectee, for the Army side of internal transport, as it already had the capability to support C-12, RC-12, U-21, and RU-21 aircraft at these locations -

- Riyadh International Airport
- Riyadh Military Airport
- Dhahran Military Airport
- King Fahd Airfield,
- and Bahrain Airport.

³⁷⁷Historian, NDSC, 31 January 1991.

³⁷⁸Historian, NDSC, 15 January 1991, notes cited.

³⁷⁹Historian, NDSC, 19 February 1991.

³⁸⁰Historian, NDSC, 23 October 1990, notes cited.

³⁸¹Historian, NDSC, 28 January 1991.

³⁸²Historian, NDSC, 29 January 1991.

Moreover, in

"addition to the personnel prepared to deploy with the 224th Military Intelligence Battalion (OV-1s and RV-1s) from Hunter Army Air Field, additional BASI personnel and equipment are being prepared to deploy with the 138th Aviation Company from Orlando, FL prior to December 1990."³⁸³

By 9 November 1990

"4. A sufficient quantity of repair parts has already been prepositioned in (the) theater to support the accelerated flying hour program experienced by deployed (OSA) aircraft. Additional repair parts inventories will be supplied under the existing total as required."³⁸⁴

The bulk of internal transport was Air Corps C-130s; together with the C-12s, they addressed an ARCENT requirement ". . . for fast response for essential aviation repair parts (which was) . . . a priority issue for . . . (that command)."³⁸⁵ In January 1991, the self-deployable, that was, it could

³⁸³MSG, MG Donald R. Williamson, CDR, AVSCOM, to the DALO-AV, et alia, 9 October 1990, subject: Maintenance Support for Operational Support Airlift (OSA) and Special Electronic Mission Aircraft (SEMA) in Theater - Update 2.

³⁸⁴MSG, CDR, AVSCOM, to the DALO-AV, et alia, 9 November 1990, subject: Operational Support Airlift (OSA) Aircraft Support for Operation Desert Shield.

³⁸⁵MSG, MG Pagonis, USARCENT, SUPCOM, to MG Donald R. Williamson, CDR, AVSCOM, 19 December 1990, subject: Operational Support Airlift (OSA) Aircraft Support Essential Logistics Missions.

fly all the way there on its own, C-23B Sherpa loomed as a potential reinforcement.³⁸⁶ The C-23B was to nest, or "bed down" at Dhahran, where . .

" . . . the 2D Aviation Brigade (Echelons Above Corps) (was to use it - actually five C-23Bs) to transport high priority aviation repair parts and other high priority cargo as determined by the ARCENT G-4 Aviation Maintenance Officer."³⁸⁷

Preparations to move the C-23Bs to Saudi were underway by mid-January 1991. Shorts Brothers, the manufacturer, was to supply maintenance personnel from its American arm at Groton, Connecticut, to support the C-23B. The first C-23B was to leave Groton on 23 January 1991 and join with another C-23B at the mother plant in Belfast, from whence the two would fly to Saudi Arabia on 6 February 1991.³⁸⁸ The C-23Bs got the "green light" on 7 February 1991,³⁸⁹ and a Sherpa alighted at Riyadh on the evening of 14 February 1991.³⁹⁰ As of 23 February 1991, two C-23Bs were flying parts along the following route - Dhahran

³⁸⁶Memorandum, Mr. Joseph P. Cribbins, Special Assistant for Air to the ODCSLOG, DALO-AV, to the Chief of Staff, Army (CSA), 8 January 1991, subject: Response to Chief of Staff, Army, Tasker (sic) Reference Status of C-130 Hercules and C-23B Sherpa Airplanes, and CH-47D Chinook Helicopter in Support of Desert Shield.

³⁸⁷FAX, AMC-PM-FW, to MAJ Edwards, HQ, FORSCOM, 15 January 1991, subject: C-23B Beddown.

³⁸⁸MSG, AMSAV-L-EOC, to the COMUSARCENT, 19 January 1991, subject: C-23B Support.

³⁸⁹Historian, NDSC, 7 February 1991, notes cited.

³⁹⁰Historian, NDSC, 14 February 1991.

to Abu Dhabi to King Khalid Military City to Dhahran, thus serving both the VIIth (KKMC) and XVIIIth Corps (Dhahran).³⁹¹

Improvement of Maintenance Facilities

Since some of the internal aerial distributions taking place might well be zone production, which in turn would undo a little of the extra burden caused by the lack of retrograde, the AVSCOM heightened its efforts to improve AOR maintenance facilities. Examples range from the small, such as the commander's attempt to re-route a Colombian-bound engine test stand to Saudi Arabia,³⁹² to the large, the cumulative effects of which were to fashion facilities in the zone of operations nearly as fine as those in the CONUS. Subjects of this latter approach featured

- Two AOAP laboratories. By the third week in November, Mobile (AOAP) Laboratory Number 2 was in fabrication and about 75 percent of its staff was in place. Laboratory Number 1, then in Saudi Arabia, had acute staffing problems.³⁹³ By 24 January 1991, the personnel problems largely resolved, the second laboratory, for the VIIth Corps, was ready to deploy;³⁹⁴

³⁹¹MSG, AMCOO-RE to the AMSAV-L-EOC, 23 February 1991, subject: AMC-SWA SITREP 183, 23 February 1991.

³⁹²MSG, MG Donald R. Williamson, AVSCOM CDR, to MG Thomas G. Lightner, CDR, United States Army Security Assistance Command (USASAC), circa 21 December 1990, subject: Engine Test Stand.

³⁹³MSG, CDR, MRSA, Lexington, Kentucky, to the CDR, ARCENT MAIN, circa 21 November 1991, subject: Army Oil Analysis Program (AOAP) Support for Operation Desert Shield (ODS).

³⁹⁴Historian, NDSC, 24 January 1991, notes cited.

- An Engine Service Center. On 26 October 1990, four OCAD personnel arrived at Abu Dhabi to form the nucleus of an Engine Service Center;³⁹⁵

- A T-63 Repair Point. The AVSOM effected this by the enlistment of Aeromaritime, a contractor with facilities on Malta, to repair T-63 engines, and the dispatch of 66 engines to that island to commence operations;³⁹⁶

- An AVCRAD Activation. On 9 February 1991, the Connecticut National Guard's 1109th Aviation Classification Repair Activity Depot (AVCRAD) received an alert to prepare for activation on the next 13th. About 90 to 120 of the AVCRAD were to deploy the last week of February 1991 for battle damage repair and classification work in Saudi Arabia;³⁹⁷ the AVSOM had previously sent battle damage repair manuals for the AH-1, UH-1, OH-58A/C, and UH-60,³⁹⁸ and using Field Manuals 90-1, 1-111, and 1-500, the ARCENT set forth the parameters for battle damage airplane actions in the AOR:

"1. The purpose of this message is to establish procedures and responsibilities for management of

³⁹⁵MSG, AMSAV-L-EOC, to the AMOOC-RE, 26 October 1990, subject: (Operation Desert Shield).

³⁹⁶MSG, AMOOC-RE, to the AMSAV-L-EOC, 28 December 1990, subject: Pass to AVSOM.

³⁹⁷Point Paper, Mr. Ronald L. Powell, Deputy Director of Maintenance, HQ, AVSOM, 15 February 1991, subject: 1109th Aviation Classification Repair Activity Depot.

³⁹⁸MSG, LTC Mellick, AMSAV-L-EOC, to MAJ T. McHale, DALO-AV, 14 December 1990, subject: AVSOM Aviation Activity.

crash/battle damaged Army aircraft within the ARCENT Theater of Operations.

"2. Scope. The policies and responsibilities set forth are applicable to all Army aviation/support units that will operate within this theater.

"3. Responsibilities. Each corps has the responsibility to develop its own guidance for battlefield damage and assessment specifically designed to fit their own scheme of maneuver within these general guidelines.

A. ARCENT G-4 Theater Aviation Maintenance Officer will be responsible for overall staff planning, management and oversight of the Theater Battlefield Damage Management Program.

B. Aviation Unit:

(1) Individual aviation units are responsible for initial recovery, within their capability, of organic aircraft.

(2) Supporting AVIM provides backup recovery support when the owning unit is overloaded or complex aircraft disassembly is required.

(3) Preferred method of recovery, depending on the tactical and enemy situation, is to repair on site. If aircraft is not repairable then it must be evacuated to the rear by ground/air assets.

(4) Initial assessment of damage must determine if the aircraft can be repaired and operational within 48 hours. If not, then aircraft must be evacuated to the supporting AVIM facility.

C. Divisional AVIM Companies:

(1) Provide aircraft recovery crews to supported unit as required.

(2) Evac (sic) aircraft to next higher AVIM if it cannot be repaired and operational within 7 days.

D. Non-Divisional AVIM Companies:

(1) Provide back-up recovery support as required.

(2) Complete in-depth battle damage assessment to determine if the aircraft can be repaired within 14 days.

(3) If aircraft can not be repaired within the time frame specified, coordinate with COSCOM POC for AVSCOM engineering support in performing an ECOD (Estimated Cost of Damage) to determine if the aircraft should be evacuated either to the theater aviation maintenance facility or depot.

(4) Provide support for cannibalized collection point of aircraft and components.

E. COSCOMS: Designate a single POC for maintenance collection and evacuate (sic) who will be

responsible for coordination of all actions with the ARCENT SUPCOM.

F. EAC AVIM:

- (1) Provide aircraft recovery support as required.
- (2) Provide support for damage assessment as required.
- (3) Provide battle damage repair as necessary.
- (4) Provide support for aircraft evacuation from the ARCENT Theater of Operations.

G. ARCENT SUPCOM:

- (1) Coordinate all Echelons Above Corps (EAC) Crash/Battle Damage Aircraft Maintenance and Evacuation activities.
- (2) Control the TAMP Repair Workload.
- (3) Ensure replacement aircraft are coordinated with the ARCENT G-4 and TAMMC.

H. TAMP (KKMC)

- (1) Establish Forward Aircraft and Cannibalization Collection Point.
- (2) Provide battle damage assessment repair parts reclamation, classification, disassembly, packaging/preservation and retrograde to TAMP FWD.

I. TAMP FWD (DHAHRAN)

- (1) Designated as the Theater Aviation Maintenance Facility.

(2) Provide maintenance support for battle damage repair within the ARCENT Theater of Operations as required.

(3) Provide AVSCOM engineer assistance for battle damage assessment to theater AVIM units as necessary.

(4) Provide for centralized aircraft reception/outprocessing with the ARCENT Theater of Operations.

(5) Function as the authority for determination of final disposition of aircraft determined to be non-repairable within theater.

J. 321st TAMMC - Coordinate all theater crash/ battle damage aircraft activities within ARCENT HQs and using units."³⁹⁹

- and a steady augmentation of AVSCOM strength in the AOR. The AVSCOM's personnel figures there were much as the locomotive with a full head of steam that suddenly confronts a red lantern; it keeps on rolling for miles. AVSCOM strength did not peak in Saudi Arabia until it reached 729 on 8 April 1991, more than a month after the war was over - and, at that time, 50 more of the Connecticut AVCRAD were due to arrive.⁴⁰⁰

³⁹⁹MSG, COMUSARCENT MAIN G-4, to COMARCENT SUPCOM, et alia, 26 January 1991, subject: Battle Field Damage Management Program.

⁴⁰⁰Historian, NDSC, 22 April 1991, notes cited.

Lift Capability

In a concerted effort to improve combat cargo capacity, the AVSCOM especially endeavoured to increase the number of "D" model CH-47s in country. The "Ds" could carry more farther than its CH-47C cousin, and only the "D" had an Enhanced Air Particle Separator. By late November, Fort Lewis, Washington, had the only available "Ds" in the CONUS, and so the AVSCOM began to look about in Hawaii, Korea, Germany, and Panama for more.⁴⁰¹

MEDEVAC

Since the shift to the attack could conceivably cause casualties, concern with that current staple of medical care, the medical evacuation (medevac) helicopter, heightened. In December 1990, BG Irby, the AVSCOM Deputy Commander, started to visit deploying MEDEVAC units to ensure that these equipments had all of the equipment which they were supposed to have or, in Army jargon, maximum Prescribed Load Lists (PLIs). The deputy found a world of work for the AVSCOM; the seven units had neither survival radios nor ASE. They were in his words, just "cut loose."⁴⁰²

⁴⁰¹1) MSG, LTC Edwin Kellam, AMSAV-L-EOC, to the Aviation Division, HQ, FORSCOM, 30 November 1990, subject: Medium Lift Capability in Southwest Asia (SWA). 2) Writer's Note: The increase of CH-47s meant that "47-peculiar tools and sets" were also scarce in SWA. See: MSG, AMCOCC-RE, to the AMSAV-L-EOC, et alia, 31 January 1991, subject: AMC SITREP No. 14, Operation Desert Storm.

⁴⁰²MSG, BG DeWitt T. Irby, Deputy Commander, AVSCOM, to BG Frix, CS, COMUSARCENT MAIN, 17 December 1990, subject: Deploying Medevac Unit.

The Commander's Touch

The General Irby Road Show

BG Irby's sojourn with the medical units was not unique. He had, broadly speaking, been on the road since November, and would remain there until well after the advent of the new year. His targets were units under alert to deploy, and he traveled with a smattering of experts⁴⁰³ in various fields who were ready to discuss anything from shrinkwrap, a covering used for aircraft to be shipped, to anti-erosion blade tape - stops for the Irby caravan included Fort Riley, Kansas, home of the 1st Division;⁴⁰⁴ Fort Polk, Louisiana;⁴⁰⁵ Fort Knox, Kentucky; Fort Leonard Wood, Missouri;⁴⁰⁶ Fort Hood, Texas;⁴⁰⁷ Fort Stewart, Georgia; Fort Campbell, Kentucky; Fort Bragg, North Carolina; and Fort Carson, Colorado.⁴⁰⁸ A typical report from General Irby was, as follows:

"2. I just got back from Ft. Hood, helping
(sic) with preparation (sic) to deploy the 3/6 Cav
to SWA. They have a few logistics challenges yet
to be taken care of, however, I see nothing that
is insurmountable or that we can't help them with.
(sic) I am concerned, however, that a slice of AVIM

⁴⁰³Sometimes after a "softening up" visit by predecessors, as at Fort Riley.
See: Historian, NDSC, 16 November 1990, notes cited.

⁴⁰⁴Historian, NDSC, 27 November 1990.

⁴⁰⁵Historian, NDSC, 30 November 1990.

⁴⁰⁶Historian, NDSC, 13 December 1990.

⁴⁰⁷Historian, NDSC, 15 January 1991, notes cited.

⁴⁰⁸Historian, NDSC, 18 January 1991.

support or a civilian augmentation to their AVUM has not been programmed into the deployment equation. My understanding is the 3/6 cavalry squadron (sic), if deployed, will be assigned at theater level with the 5/229 Attack Battalion. The 5/229 deployed with it's (sic) AVUM and has now been satellited on AVSCOM's TAMP-FWD for AVIM support. We have a very limited capability in TAMP-FW (sic) to provide AVIM support for an AH-64 Battalion. Adding another Battalion/Squadron to the force structure will, in my view, require an AVIM capability augmentation. Note. The 214th AVIM being assigned at theater level will not have an AH-64 capability.

"3. We are about to run out of capability to ship aviation units by air. It is imperative that transportability kits in SWA be centrally controlled, i.e., (sic) located at TAMP-Dhahran, which will allow selected (sic) returned to CONUS to support future air shipments of AH-64 battalions or other aviation units."⁴⁰⁹

⁴⁰⁹Ltr, BG DeWitt T. Irby, Deputy CDR, AVSCOM, to the COMUSARCENT MAIN, et alia, 10 February 1991, subject: Continued Deployment of Aviation Units.

Three Stars

The Commander, AMC, was not amiss when he wrote that " . . . sustaining . . . Operation Desert Shield II . . . will be a real test."⁴¹⁰ Especially since ODS I had not been facile of itself; despite frequent AVSCOM claims of beautifully harmonic relations between itself and the XVIIIth Corps,⁴¹¹ the latter did not seem wholly blissful as late as 28 November 1990, when it reported to MG Williamson that, despite

" ALOC flowing smoothly (, and)
 a dedicated force of contractor represen-
tatives, AVSCOM technicians, and unit mechanics
(It was) Despite (its) best efforts,
struggling to maintain (underscore XVIIIth's) (a)
75% Mission Capable (rate,) much less the 80% we
desire 50% of the time (we spend on)
taping, erosion, dents, and tip caps. . . . (We have)
30% NMCS. Most of the remainder (of our problems
are) engine related, (sic) Clearly the
environment is beating us down

"5. (We have these problems despite, for
example, a) UH-60 OPTempo over the past 30 days
 (of) 17.8 hours per aircraft per month
 (which is) yielding an average MC of 76.8

⁴¹⁰Ltr, CDR, AMC, to the CDR, AMCCOM, et alia, 11 January 1993 (sic, actually 1991), subject: Sustaining the Operation Desert Shield II (ODS II).

⁴¹¹Writer's Note: Such as: Historian, NDSC, 15 April 1991, which usually, as in this case, presented the VIIth Corps as a collection of cry-babies.

percent. An obvious concern is the MC rate if we accelerate to wartime optempo. While current AH-64 availability is over 80%, we're concerned about parts at a wartime tempo as well (We) need help."⁴¹²

In answer to this plea for succor, and to the cares of the VIIth Corps, as well, General Williamson decided to put the other two of the AVSCOM's three stars on the road - first to Europe, then to Saudi Arabia. On 26 November 1990, he began formal trip preparations with the reception of an internally-prepared 3-hour briefing on the insufficiencies of the USAREUR's aviation logistics.⁴¹³ The commander⁴¹⁴ spent November the 29th, 1990, until December the 3rd, 1990, in Saudi Arabia; he departed Dhahran on December the 3rd, 1990, for Heidelberg. On December the 6th, 1990, the commander returned to Saint Louis.⁴¹⁵ The commander had four objectives in Saudi Arabia: one, to improve, in coordination with aviation representatives there, the aviation logistics structure; two, to attend a weekly theater aviation

⁴¹²Ltr, CDR, XVIIIth Airborne Corps, to the CDR, AVSCOM, 28 November 1990, subject: UH-60 Availability.

⁴¹³Historian, NDSC, 26 November 1990, notes cited.

⁴¹⁴Writer's Note: Another comment on the relative importance of the HQ, AMC, in this affair was a Saudi refusal to permit General Tuttle, the AMC Commander, to visit. See: Historian, NDSC, 26 December 1990, notes cited.

⁴¹⁵Itinerary, courtesy Mrs. Annette Duckworth, the Commander's Secretary, 17 May 1991.

logistics conference; three, to visit aviation units to discuss initiatives for, and to resolve issues about, aviation logistics capabilities; and, four, to visit theater aviation maintenance facilities.⁴¹⁶

Much came of the commander's trip. He " . . . got 90 new issues . . . (and) worked (them) all . . ." Tasks included either the movement of the TAMP-SA to adjust to two corps, or the placement of contract teams in both corps areas, or both; the renewal of a promise to put 30 "days worth" of spares at TAMP-Base; an attempt to improve the priorities of AIMI and AOG; an endeavour to secure more dedicated internal air, with the use of C-23B Sherpas; the activation of an AVCRAD for the classification and repair of battle-damaged items and equipment; and, perhaps most importantly of all, the publication of a monthly newsletter which would detail the most striking current issues, often graphically, with the names and telephone numbers of pertinent AVSCOM personnel.⁴¹⁷

The commander's trip was also timely. On 19 December 1990, the AMC, noting that the original Desert Shield Class IX Resupply Package was to support a four-and-a-third division-sized force, issued an alert order for a second package for the VIIth Corps.⁴¹⁸ The AVSCOM Commander thereafter made a

⁴¹⁶MSG, CDR, ARCENT MAIN, to the CDR, AVSCOM, 30 November 1990, subject: Theater Clearance for MG Donald Williamson, Commander, AVSCOM.

⁴¹⁷Ltr, MG Donald R. Williamson, CDR, AVSCOM, to the Deputy CDR, COMUSARCENT MAIN, 28 December 1990, subject: Theater Aviation Maintenance Support Program - Saudi Arabia (TAMP-SA).

⁴¹⁸MSG, AMCCOC-RE, to the CDR, AMCCOM, et alia, 19 December 1990, subject: Alert Order for Second Class IX Resupply Package for Operation Desert Shield.

concerted attempt to fill this package for the VIIth, though he had to struggle, per past notice, against the transportation snarl and the supply strain. On 10 February 1991, he offered an accounting of his efforts to the VIIth. . . .

"1. Received your message on 6 Feb 91 regarding parts support, the (sic) same day, COL Raines informed us that MAJ Wright from the 321st had been to the 7/159 and reconciled their ASL shortages. As soon as we receive the reconciled listing, we will vigorously strive to fill your ASL "D" balances and other requirements.

"2. The current AIMI program consists of 152 items and I have asked our VII Corps LAR supervisor to reconcile the differences between the corps number of 172 and AVSCOM's lesser number. In addition, I just finished a review of the stock available to support AIMI requirements and we have quantities to meet AOG requirements, as well as most replenishment requirements. The 321st just provided me a detailed list of the theater's AIMI inventory (Both corps included) and after review, I have asked them to do an immediate reconciliation, for I have no outstanding requisitions due, yet there are many zero balances. We are aggressively searching for ways to overcome the shortfalls. I understand from your aviation liaison officer that six vans of

AIMI from Europe arrived at KKMC on 7 Feb 91 and that the 321st pushed ship a number of items.

"3. In regard to order-ship time, we are feverishly working the DA DCSLOG to make the transportation system more efficient and timely. The recent general officer sessions at Charleston (Desert Express) and Dover (ALOC) have resulted in policy changes that will greatly influence the flow of aviation class in (I.E., now priority number two instead of 13). I don't mean to debate statistics with you, but our desert express experience is 2-5 days from receipt of your requisition until lift off at Charleston. In addition, we are shipping forward out of Abu Dhabi daily, less than 24 hours after receipt of a requisition. We don't have visibility of when (sic) you receive the items for there appears to be a glitch in the theatre data systems.

"4. The 321st MMC is the custodian (988th Repair Parts Company) of a 15 day AIMI level as well as over 2000 (sic) lines of aviation materiel. As reported at the 7 Feb 91 maintenance meeting, they are working to establish the proper automation edits that will facilitate in-theater issue of these stocks. Stock has also been released to establish 95 lines of RX

in TAMP-KKMC over and above the TADS/PNVS levels.

"5. During the past weeks, we have 63 AOG requisitions from VII Corps. This is not a large volume considering the number we receive in the rest of the theatre. All of your AOG's (sic) have been filled.

"6. Our view of DODAAC WK4GEH and WK48BT reveals that of 1448 (sic) requisitions received 84.2% or 1220 (sic) have been released. We have also satisfied 68 of 70 (97%) of the 9AU requisitions. All backordered items will be released as soon as assets are available. Expected release date of the two 9AU backorder is NLT 10 Feb 91.

"7. COL Raines informed us on 7 Feb 91, that the C-130 flight is working great. Some days two flights are made. 15-20 pallets per day of aviation parts are going on these flights. This is a significant breakthrough in moving cargo.

"8. COL Raines and MW4 (sic) Nance informed us that the IPS and tape teams are in place and working for VII Corps. Twenty-four personnel are at KKMC, with a total of 57 at KKMC and TAMP-FWD ramping (sic) towards the agreed of (sic) 41 aircraft per week. We appreciate you providing the

facilities and life support for our personnel at KKMC.

"9. We will continue to work to streamline the process. With your DAS3 now on line and the maintenance teams working, VII Corps should see a significant enhancement of its sustainment posture. Thank you for providing us the feedback so we can help you"419

The commander extended his efforts even further by placing personal attention on each of the VIIth's elements. To the 1st Cavalry Division, for example, he wrote . . .

"1. We are working the list of required resources you highlighted in your message. Many items should be available at the 321st (AIMI) and TAMP-KKMC (TADS/PNVS and Apache LRU's (sic)). We are gathering others for a consolidated 1st Cav shipment to make sure the parts get to you. We will try and make that happen within a week . . .

C. RX

Test Sets, Non-divisional shop set (,) T/P and Apache LRUs avail at 7-159 or TAMP-KKMC.

D. AVSCOM is ready to ship replacement sets as soon as we get requisitions/communication

⁴¹⁹Ltr, MG Donald R. Williamson, CDR, AVSCOM, to BG (P) Daniel, DCG, VII Corps, 8 February 1991, subject: Aviation Parts Support.

of 7-159 requirements from the theater.

Requisition, transportation, and distribution are a corps wide problem that is currently being worked by BG Walt Yates for the corps commander.

E. Supply LAR. I have advised the AMC DCG Readiness of your needs for a Supply LAR. Mr. Golsen, AMC Log Mgmt Specialist, should be able to give you some interim support.

F. CL IX. We are consolidating your list of aviation unit spares and will request a special air mission for delivery. Review of your document numbers indicate 31 filled with 16 shipped. Fifty-four requisitions could not be identified which may indicate they were consolidated under division MMC document numbers when passed to AVSCOM. We will generate requisitions using your fiscal data for these B17, DLA, B16, and B64 items.

"6. AIMI. There is no record of the six AIMI components. Most of the AIMI items are in theater and should be requisitioned through the 321st . . ."420

⁴²⁰Ltr, MG Donald R. Williamson, CDR, AVSCOM, to BG(P) (Promotable, that is, he was awaiting formal elevation to MG) Tilelli, CDR, 1st Cavalry, 10 February 1991, subject: Aviation Logistics Support.

Desert Storm: The Seven-Week War

16 January - 27 February 1991

Perspective

While the entry of the VIIth Corps intensified the AVSCOM's tasks for SWA, it did not fundamentally alter their execution. The enemies, sand, and the resultant erosion, were just as deadly in November of 1990 as they had been in the preceding August.

"3. Sand erosion continues to be the major problem facing aviation units and the greatest contributor to downtime."⁴²¹

. . . . and their chief victims continued to be blades⁴²² and engines.⁴²³ The AVSCOM would try novel ways to redress the relentless damage,⁴²⁴ but its mainstays still were anti-erosion blade tape,⁴²⁵ paint, the imposition of

⁴²¹MSG, AMCOO-RE, to the AMSAV-L-EOC, 21 November 1990, subject: AMC-SWA SITREP #90, 21 November 1990.

⁴²²MSG, AMCOO-RE, to the AVSCOM-L-EOC, 20 November 1990, subject: (Operation Desert Shield)

⁴²³Writer's Note: Such as a shortage of T-63s for the OH-58D. See: Historian, NDSC, 5 February 1991.

⁴²⁴Writer's Note: Such as "bead blasting," or the use of small plastic beads fired at high pressure to clean such engine items as compressor blades. See: MSG, AMSAV-L-EOC, to the AMCOO-RE, 21 December 1990, subject: (Operation Desert Shield).

⁴²⁵MSG, COL Ramon Ivey, Director of Readiness, AVSCOM, for the CDR, AMC, 21 November 1990, subject: Weapon Systems Management - Southwest Asia, 21 November 1990.

mandatory blade tip cap maintenance requirements,⁴²⁶ and filters, filters, and more filters.⁴²⁷

Since both the tape and blades were only palliatives, not remedies,

" . . . a rotor blade on the Black Hawk
lasts 60 hours in this stuff - not 1,000 hours
or 10,000 hours - before we have to take it off
to do repairs or tape it. . . .

"(While the sand) files the compressor
blades (of the engine) so thin they bend and
curl over (So much sand actually gets
in the engines that) the sand and air (combine
to) create . . . glass."⁴²⁸

. . . . the AVSCOM perforce had to increase its supply of both blades and engines, as well as a host of other parts.

Again, to pursue our theme of continuity, the AVSCOM commander had been aware of this for a long time, indeed, since at least as early as October of 1990. During that month, he called for the collection of a 90-day parts stockpile⁴²⁹ to avoid both a "parts explosion", that was, an insatiable and

⁴²⁶MSG, AMSAV-L-EOC, to the AMCOC-RE, 9 December 1990, (same subject).

⁴²⁷Writer's Note: Blissfully, for the reader, not followed by footnotes, footnotes, and more footnotes, but just one: Briefing, Director for Materiel Management, HQ, AVSCOM, 14 January 1991.

⁴²⁸J. C. Ferlisi, Editor, "As Desert Storm Rages: AVSCOM Pledges Increased Inventory," Gateway Reporter, Volume 14, Number 2, February 6, 1991, pp. 1, 8.

⁴²⁹Historian, NDSC, 23 October 1990, notes cited.

unanswerable demand for parts,⁴³⁰ or its grim alternative, cannibalization.⁴³¹ He had also realized that one could not supply parts that did not exist, and so he had increased, or "surged," the production of said parts, taking into account such variable tasks as the establishment of delivery schedules, the identification of parts and components, the analysis, and resolution, of industrial base shortages, and the assignment of priorities for materials and components.⁴³² Finally, he had attempted to ease the demands on production and transportation by the augmentation of maintenance and repair actions and facilities in the zone of operation. In mid-February 1991, the AVSOM Logistical Director summarized the current state of all these interests:

" - There is stock on-hand in Theater
(Retail AIMI plus wholesale) to meet or exceed
a one month wartime surge rate for the following
aircraft: UH-1 OH-58C AH-64A UH-60L AH-1
OV-1 CH-47D OH-58D.

" - The following aircraft system does not
currently have a sufficient quantity of engines on-
hand in the theater of operations to meet a wartime
surge rate.

⁴³⁰Historian, NDSC, 11 October 1990.

⁴³¹Historian, NDSC, 22 October 1990.

⁴³²Ltr, Lieutenant General (LTG) Billy M. Thomas, Deputy Commanding General (DOG) for Research, Development, and Acquisition, HQ, AMC, to the CDR, AVSOM, et alia, 4 February 1990, subject: (Operation Desert Storm).

" — UH-60A (T700 Engine). Special repair procedures developed and in use at units and (at the) TAMP (sic). Depot repair capability (is) established at Abu Dhabi. Extra modules (have been) procured to facilitate rapid repair at units and (at the) TAMP. All sources of repair (are) surging (AVIALL, GE, CASA and CCAD). (The) Inhibitor is (a) rapid return from field Army of unserviceables. AVSCOM has requested to use Desert Express aircraft to evacuate unserviceable engines that exceed in-country repair capability.

" - The environment has significantly reduced engine service life, but (it) can be minimized with engine particle separators.

" - All engines (are) protected with improved particle separator (or being install (sic) - AH-1/UH-1) with (the) exception of CH-47D.

" - Interim filter (is) available (socks) (sic) and initial delivery of engine particle separators (22 each) have arrived in-country (600 hour modification)."⁴³³

⁴³³Point Paper, Mr. Daniel J. Rubery, Director of Logistics, HQ, AVSCOM, 14 February 1991.

Four days after the appearance of the Logistical Director's paper, the AVSOM commander summarized recent AVSOM actions, made some recommendations for betterment, and called for more harmony between aviation logistics supplies and customers . . .

"1. The purpose of this message is to update current aviation logistics activity in SWA and to suggest steps for continuous improvement.

A. Aviation Maintenance.

(1) AVSOM contractor augmentation with each corps.

(2) TAMP KKMC providing corps overflow, battlefield damage repair, MWO application.

(3) TAMP Forward Dhahran-MWO, engine and component repair.

(4) Depot and SRA repairs in UAE.

B. Aviation Supply.

(1) AIMI stocks positioned at 321st MMC (988th Repair Parts Co.)

(2) RX at TAMP-KKMC.

(3) Depot stocks at UAE storage facility (AIMI and high demand items).

(4) Special project stocks (filters, tools, AGSE, ASE, etc.)

C. Transportation.

(1) 9BU LOC.

(2) 9AU Desert Express (Dhahran and KKMC destinations).

(3) Intra-theater C-130 and ARNG C23B daily round robin from UAE-DHAHRAN-KKMC supporting issue of AIMI, battlefield spares, retrograde, and repair of RX and reparable components.

D. Technical

(1) 70 AVSCOMLARS (sic)/Contractor Field Service Reps.

(2) 5 AVSCOM Engineers.

"2. Enhancement initiatives required to sustain the ground war.

A. Theater Assistance/Suggestions.

(1) 321st MMC/988th Repair Parts Co.

(A) Release of 2000 (sic) lines of aviation parts to the corps AVIM's (sic).

(B) Act as the theater single manager for AIMI, stock 15-day level and cross level between corps.

(C) Move all AIMI into a consolidated TAMP/988th/321 location, for one stop aviation maintenance and supply.

(2) Make sure aviation unit DODAC (sic) destination addresses have been changed to reflect current locations.

(3) Establish/maintain corps AOG POC's (sic) with AVSCOM.

(4) Continue to streamline and improve communications and requisition processing.

(5) Streamline flow of aviation unserviceable (sic) retrograde through a single collection point (TAMP-KKMC) and utilize the NG AVCRAD.

B. ARCENT-DESCOM-LCA.

(1) Continue to support priority movement of 9AU/9BU aviation parts. AVSCOM has received more than 65,000 requisitions and has satisfied 97.6 percent. Yet there are still more than 4,000 parts waiting or in an intransit shipping status.

(2) Make every attempt to package and palletize by commodity (aviation) and corps. Units do not have the time or manpower to search through acres of pallets, nor can they readily find their critical items in multipacks.

C. AVSCOM -

(1) Will provide addressees a daily list of critical aviation spares requiring priority movement.

(A) First, 9AU AOG which represents an aircraft on the ground for a part. These parts must pole vault over all others to keep combat helicopters flying.

(B) Next is 9BU AIMI to keep stocks replenished for immediate issue to meet an AOG request.

(C) Third is the movement and sustainment of a 30-day level of battlefield spares so parts can be quickly provided from theater stocks.

D. There will be some special projects where we may need help. These will be worked case by case.

E. Will (sic) continue to refine and expand RX LRU and component exchange at KKMC.

"3. There has been difficulty with reconciliation of ASL shortfalls and requisition activity with VII Corps, a recognized need for sustainment stocks in both corps, and many parts making their way through the transportation and distribution process. With time and this circumstance of essence, AVSCOM will identify and push packages of DLA common items to DIV AVIM's (sic), and will immediately begin pushing a representative percentage of battlefield spares from UAE to TAMP-KKMC for delivery to the two corps AVIM's (sic) (7/159th and 8/158th [sic]).

"4. The process for AOG and replenishment stocks is in place. We need to all work together for continuous improvement of any symptoms that impede the smooth flow of aviation parts."⁴³⁴

By the 14th of January, 1991, the AVSCOM had, by the commander's reckoning, 70,000 parts, or battlefield spares, at Abu Dhabi, covering over 600 lines of equipment;⁴³⁵ by the 23rd of the same month, there were over 80,000 of these parts,⁴³⁶ versus an entirely arbitrary, but pleasant sounding, objective of 100,000 parts.⁴³⁷

None of this impressed the VIIth Corps:

"3. With respect to the 60,000 parts in Abu Dhabi we are not yet the seven-day OST (Order Slip Time) we'd been told to expect for CONUS originating Desert Express shipments. Rest assured we are aggressively tracking our requisitions through the 321st to AVSCOM for AOG and AIMI items (sic). Almost daily phone calls are the rule to your people from our aircraft materiel managers in the Corps Materiel Management Center.

⁴³⁴MSG, MG Donald R. Williamson, CDR, AVSCOM, to MG Taylor, CDR, USARCENT Rear, Fort McPherson, Georgia, et alia, 18 February 1991, subject: Desert Storm Aviation Logistics Support.

⁴³⁵Historian, NDSC, 14 January 1991, notes cited.

⁴³⁶Historian, NDSC, 23 January 1991.

⁴³⁷Historian, NDSC, 28 February 1991.

"4. With respect to aircraft spares at KMC, we understand the intent to put 15 days of supply on the ground with the remainder as backup at Abu Dhabi. Either fifteen days is not there yet, or there is insufficient in-theater visibility so the parts are not routinely released to us in response to our requisitions."⁴³⁸

The Obstacles

Flying Hours

Not counting the VIIth Corps, the chief logistical barriers to the AVSCOM, world-wide flying hours and transportation, already discussed at length, would remain set in place for the remainder of the Southwestern Asian operation. The former was alterable, but, unfortunately, not amenable, despite repeated entreaties by the AVSCOM commander on this subject, as in this late January 1991 letter to the CINCUSAREUR in which he tried to give that commander " . . . a better appreciation for . . . (the) rationale . . . (vis-a-vis the) messages for DA ODCSOPS and ODCSLOG regarding the need to conserve flying hours.":

"2. We began the Desert Express/ (sic) Storm Campaign with Spares Inventories purchased 12-18 months ago to support a peacetime flying hour program. Not only did we have to contend with lead time, but spares and war reserve programs that

⁴³⁸MSG, CDR, VII Corps, to the AMSAV-L-EOC, 4 February 1991, subject: Aviation Parts Support.

were underfunded. As the 18th Corps deployed to SWA, we experienced an immediate increase in op (erational) tempo and component wearout rates that were 2-10 times greater than we've ever experienced, especially rotor blades, engines and APU's (sic). Components have also been consumed at accelerated rates during predeployment and in theater stand-downs as they prepare to enter various phases of the campaign.

"3. We have positioned approximately 2600 (sic) AIMI items (engine transmissions, rotor blades, etc.) in each corps and additional (sic) 30 days of AIMI and battlefield spares in theater. This means we have shipped more than 80,000 aviation components to support our aviation units in SWA.

"4. More than 70 percent of our current delivery schedules, have (sic) been improved, depot overhaul programs surged and now procurements initiated, but as yet our issues are outdistancing receipts. We have a full court press (an all-out effort) and will do our best to improve our supply posture, and (sic) will support relaxation of flying hour constraints as soon as circumstances permit."⁴³⁹

⁴³⁹MSG, MG Donald R. Williamson, CDR, AVSCOM, to the Commander-in-Chief, United States Army Europe (CINCUSAREUR), et alia, 26 January 1991, subject: Aviation Flying Hour Program.

The failure to reduce flying hours elsewhere no later than October of 1990 had a direct effect on the zone of operations. On 1 December 1990, the following monthly flight hour restrictions went into effect there:

<u>Aircraft</u>	<u>Hours</u>
AH-64	15.3
AH-1	16.4
UH-60A	18.1
UH-1	18.9
OH-58C	15.3
EH-60	18.7
CH-47D	14.3
RU-21	60.0
OV/RV-1	32.7 ⁴⁴⁰

Moreover, the restrictions meant that the XVIIIth could not get certain aircraft which it wanted, such as more AH-64s, because the AVSCOM could not sustain them, and it would have to await others, such as the AH-1F replacements for the tactically vulnerable AH-1Es.⁴⁴¹

⁴⁴⁰MSG, CDR, XVIII Airborne Corps, to CDR, 24th Infantry Division (Mechanized), et alia, 7 December 1990, subject: FY91 Flying Hour Program.

⁴⁴¹₁) MSG, COMUSARCENT MAIN, to the DAMMO-ODO-AOC, HQ, DA, et alia, 10 December 1990, subject: Prioritization of Equipment and Ammunition Flow in Support of Operation Desert Shield. 2) Writer's Note: The AMC would later mollify the ARCENT by the placement of the requested AH-64 battalion in its Aviation Theater Replacement Plan: 1)MSG, AMCOC-RE, to the COMUSARCENT MAIN, (61-sic) (16) January 1991, subject: Aviation Theater Replacement Plan.

Transportation

The belated cut in flying hours had already significantly strained the transportation system, which was close to clogged in the United States and in the zone of operations. The AVSCOM cast about for assistance and began to send in the Sherpas

"Most aviation parts are available, especially for AOG aircraft. However (sic), a severe transportation backlog in CONUS has slowed the pipeline. FORSCOM has assigned an ARCENT liaison officer to help prioritize Army air cargo for movement to the AOR (Area of Responsibility, id est, Saudi Arabia) IAW (In Accordance With) ARCENT priorities. Within theater, two C23 (Sherpa) fixed wing aircraft are due to arrive 6 Feb. These aircraft will be used to transport high-priority aviation parts within the theater. Tentative schedule includes delivery to and from Abu Dhabi, Dhahran, IPS (In-Line Pump Station) 3, and KMC. Another three C23's (sic) are due in theater during March. Additional scheduled stops will be added at that time."⁴⁴²

⁴⁴²MSG, COMUSARCENT MAIN, to CDR, V Corps, Frankfurt, Germany, 31 January 1991, subject: Logstat Reporting/Mo 146/292000 Jan 91/0412.

Requisitions

Perhaps the greatest flaw in the delivery of parts was the mis-use of the requisition procedures. Early in the game, to recall, all requisitions had almost immediately assumed a 9BU priority, even nuts, bolts and washers.⁴⁴³ The AVSCOM's response was to obtain a new priority code, 9AU, which, again to repeat, had become inextricably linked with the supposedly truly critical AOG.⁴⁴⁴ As anyone even remotely familiar with the workings of a bureaucracy might guess, nuts, bolts, and washers steadily and surely became 9AUs. Redistributions of the ensuing cargo jams became a necessity and, again almost inevitably, a few truly legitimate 9AU, AOG, and AIMI entries were probably the innocent victims of "Operation Un-Pile"

"1. Tilt - "(The) RRAD is diverting 93,000 lbs of 9AU cargo -- to be handled like (sic) 9BU cargo." This means truck to (the) NCAD who (sic) already has a huge backlog of pallets, trucks waiting to be unloaded, and cargo at contractor facilities that can't be moved forward without a lengthy appointment. Not only is this time consuming, but there is also a chance this could be diverted to surface -- too late. I'm certain

⁴⁴³Historian, NDSC, 22 October 1990, notes cited.

⁴⁴⁴Writer's Note: The 9BUs were, more properly, Not Mission Capable, Supply (NMCS)-9BU-999. BG Irby noted that all XVIIIth Airborne Corps requisitions were NMCS-9BU-999, and he wrote that: "(The) AVSCOM's new term for real NMCS requirements is Aircraft on the Ground (AOG)." See: Ltr, BG DeWitt T. Irby, Deputy CDR, AVSCOM, to the CDR, XVIII Airborne Corps Forward, 19 October 1990, subject: Aircraft Readiness Initiatives for Desert Shield.

there are many 9AU aviation parts in the 93,000 lbs that are needed to keep combat helicopters flying. One of our corps commanders has indicated that aviation parts are not being received - they may be among those being stored, trucked, "(sic) appointed or waiting clearance.

"2. We shouldn't move any 9AU aviation parts out of RRAD to NCAD until we can get a handle on the impact - I've discussed this situation with GEN Karegeannes. We feel there is a real need for additional Desert Express aircraft and more MAC ALOC help. Dependable air transportation is an absolute must if sustaining Army aviation is in the battle plan of the SWA campaign. Need your help."⁴⁴⁵

Programmes

Entreaties for assistance were apt, for the AVSCOM had, when the war began, reached the apparent limits of its capacities. Its programmes were in operation, its innovations, such as the AOG, were now commonplaces, and its teams had addressed every conceived aviation logistics subject. Its commander had wanted all in readiness by 15 January 1991, the President's get-out-of-

⁴⁴⁵MSG, MG Donald R. Williamson, CDR, AVSCOM, to the CDR, AMC, 26 January 1991, subject: SITREP/HQ DESCOM/25010009.

Kuwait-or-else deadline,⁴⁴⁶ and, within the definite limits of its powers, the command had largely achieved its aims. The race-a-self-imposed deadline had worked; early emphasis had, the VIIth Corps notwithstanding, put the parts, the people,⁴⁴⁷ and the production capacity in the AOR before the hopeless ensnarlment of the transportation and requisition functions. The results of these endeavours were cumulative and found their most dramatic expression in aircraft readiness rates. On 18 December 1990, the 1,007 aircraft in the AOR had a total Mission Capable (MC) readiness rate of 81 percent;⁴⁴⁸ on 3 February 1991, with a more than 50 percent increase in aircraft strength, the MC readiness rate reached an astonishing 90 percent:

<u>Model</u>	<u>Number</u>	<u>Number MC</u>	<u>Percent MC</u>	<u>Projected Model Totals</u>
AH-64	209	196	94	287
UH-60	280	251	90	364
UH-60V	68	61	90	53
EH-60	27	26	96	29
OH-58C	308	289	94	342
OH-58D	86	77	90	111
CH-47D	132	115	87	162
AH-1	141	124	88	196

⁴⁴⁶Historian, NDSC, 14 January 1991.

⁴⁴⁷Writer's Note: Four hundred and thirty-three in the AOR as of 15 January 1991. See: Emergency Operations Center, Briefing, 15 January 1991.

⁴⁴⁸FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 20 December 1990, subject: Summary Aircraft Status.

UH-1H	192	167	87	237
UH-1V	<u>115</u>	<u>111</u>	<u>88</u>	<u>141</u>
	1,558	1,407	90	1,922 ⁴⁴⁹

Assembled within, and dispatched from, the yard, the AVSCOM train was now high-balling. Its hot boxes oiled, the command was able to handle those to-be-expected minor crises in aviation logistics such as cracked OH-58D tail booms⁴⁵⁰ or a T-53 engine "wipe-out";⁴⁵¹ attend to a host of special requests, some serious, such as the provision of command-and-control airplanes⁴⁵² and the armament of OH-58Ds,⁴⁵³ some downright mischievous, such as the never-ending message traffic on OV-1D improvements, said refinements to these nearly obsolete airplanes to include armament with the

⁴⁴⁹FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 3 February 1991, subject: Summary Aircraft Status.

⁴⁵⁰1) FAX, MG Tilelli, CDR, 1st Cavalry Division, to MG Donald R. Williamson, CDR, AVSCOM, 11 February 1991, subject: (OH-58D Tailboom Cracks). 2) FAX, COL Ramon A. Ivey, Director of Readiness, HQ, AVSCOM, 11 February 1991, (same subject). 3) MSG, COL Ramon A. Ivey, Director of Readiness, AMSAV-L-EOC, to the AMOOC-RE, 13 January (sic, actually February) 1991, (same subject). 4) FAX, LTC Thomas Prickett, AMSAV-L-EOC, to MAJ McHale, DALO-AV, ODCSLOG, 15 February 1991, (same subject). 5) MSG, AMOOC-RE, to the AMSAV-L-EOC, 22 February 1991, subject: AMC-SWA SITREP 182, 22 February 1991.

⁴⁵¹Writer's Note: Fifty-three T-53s "consumed" in 5 days. See: Historian, NDSC, 26 February 1991, notes cited.

⁴⁵²1) MSG, CDR, FORSCOM, Fort McPherson, Georgia, to the CDR, USASIX Army, Presidio of San Francisco, San Francisco, California, 14 December 1990, subject: Utility Fixed Wing Aircraft Support for CG (Commanding General) ARCENT. 2) MSG, MG Donald R. Williamson, CDR, AVSCOM, to MG Frix, CS, ARCENT FWD, circa 15 January 1991, subject: Command and Control Aircraft.

⁴⁵³MSG, DAMO-FDV, ODCSOPS, to the COMUSARCENT MAIN, G-3 Aviation, 14 December 1990, subject: Rapid Deployment Kits for "PRIME CHANCE" aircraft.

air-to-air Stinger Missile;⁴⁵⁴ and, finally, even to indulge in the continuing placation of the VIIth Corps, to include its repeated attempts to secure more AH-64s, this time by raiding the float, despite an inability of the supply system to support such an increase.⁴⁵⁵

Maintenance

The Ideal and the Real

The one AVSCOM desert blossom which had not fully flowered was its maintenance seedling, the TAMP-SA. This not the product of tardiness, but rather an inescapable consequence attendant to the difficulties inherent in fashioning an appropriate amalgamation of men and machines to meet those rather thorough-going mission requirements given to that youngster.

TAMP-SA: Mission and Structure

General

The TAMP-SA was to provide theater aviation support for passback AVUM/AVIM, for forward deployed AVUM/AVIM augmentation, and for limited aviation depot support. The TAMP-SA consisted of two main elements:

one, TAMP-SA Base. Located at Abu Dhabi, UAE, the base offered a secure area to house critical wholesale supply and maintenance activities,

⁴⁵⁴1) MSG, CDR, 15th Military Intelligence Battalion, to the CDR, AVSCOM, circa 14 February 1991, subject: (Armament of OV-1D). Writer's Note: The 15th also complained about supply in general. See: 2) MSG, COL James H. Bennett, Director of Fielded Aviation Systems, HQ, AVSCOM, to the CDR, VII Corps Maintenance Forward, et alia, 23 February 1991, subject: OV-1 Support.

⁴⁵⁵1) FAX, AMCCO-SM, HQ, AMC, to the AMSAV-L-EOC, 2 February 1991, subject: VII Corps Logistics Issues. 2) Writer's Note: America's allies suffered, as well; the AVSCOM could not make an early delivery of Apaches to the United Arab Emirates because war demands currently exceeded production rates: Ltr, MG Donald R. Williamson, CDR, AVSCOM, to General Harvey, DALO-ZC, ODCSLOG, et alia, (14 January 1991), subject: AH-64 Apache Helicopter for United Arab Emirates (UAE).

as well as SRAs for the TADS/PNVS, for the MMS, for engine repair, for major structural repairs, such as rotor blades, for an oil analysis laboratory, and for a modern nondestructive test facility. The base also had a significant capacity for growth.

and, two, TAMP-SA Forward at Dhahran. The Forward had four main elements that met the immediate need to repair a component, system or aircraft and return it to the customer. The four elements were:

- a headquarters element;
- Contract Field Teams (CFTs);
- Technical Assistance Activity;
- and, supply.

The CFTs had a structure that enabled them to augment and to collocate with each of the non-divisional AVIMs. Their objective was to keep the aircraft with the user.

The Technical Assistance Activity was the second most important element of the Forward. Its primary mission was to keep as many components and repairs at the AVIM/AVUM level as could safely be accomplished by such measures as cannibalization, inspection, and battle damage repairs. The activity's personnel were to be able to make on-the-spot evaluations and were to include engineers, LARs, CFSRs from industry, and a contract nondestructive analysis team.

The supply team was to have a nucleus of personnel at the COSCOM Aviation Supply Support Activity (SSA) who would be responsible for all supply and warehouse actions to "pipeline" between the TAMP-SA Base and the TAMP-SA Forward. These supply folks also worked with the COSCOM SSA for those supply actions which supported TAMP-SA maintenance actions.

The TAMP-SA had three extra elements. The forward had a structural repair team which could deploy but whose main aim was to execute manhour intensive repairs up to depot level, such as tail boom replacements, and it had armament teams composed of CCAD personnel who could either repair armament systems beyond AVIM capabilities or recommend dispositions. The TAMP-SA Base had an engine repair capability.

Connecting the Forward and the Base was a dedicated ALOC to transport skilled personnel to points of need and to repair and return rapidly " . . high (sic) sophisticated . . . " but scarce, technical components.⁴⁵⁶

To these duties the AVSCOM commander proposed to add, in December of 1990, that of responsibility for float aircraft management in theater:

"1. During your recent visit to ARCENT, we discussed a plan to push forward to TAMP-SA Rear fully operational aircraft that would be readily available to issue as replacements for combat losses. I believe this is an excellent plan and fully support the concept and would like (to know the) number and types (of aircraft under consideration)"⁴⁵⁷

General Williamson, the AVSCOM Commander, envisioned the TAMP-SA, in final form, as a sort of "one-stop" DA Civilian (DAC)-managed, shopping centre for the aviation logistics customer. The TAMP-SA, divided into broad areas of

⁴⁵⁶Fact Sheet, AVSCOM-L-EOC, 23 August 1990, subject: TAMP-SA Concept.

⁴⁵⁷MSG, COMUSARCENT MAIN/DCG, through BG(P) (Promotable) Frix, DCG, ARCENT, for MG Donald R. Williamson, CDR, AVSCOM, 28 December 1990, subject: Theater Aircraft Support.

maintenance and supply, would feature, department-store style, nooks in which one might repair one's mast-mounted sight, get one's blades taped, "RX/DX" one's worn parts, "MWO" one's airspeed transducer, and overhaul one's eroded engines.⁴⁵⁸

Engine Repairs

The most prominent omission in the commander's list was, as the war neared, the last one, engine repair. Thus, although the AVSCOM began, in late October of 1990, to create " . . . an engine service center at (the TAMP-SA) (to reduce) the number of engine removals resulting from environmental factors and . . . (to shorten) the turn around in original time for those engines that must be removed for repair . . . ,"⁴⁵⁹ there is, approximately two months later, no mention of such duties in a description of TAMP-SA activities:

"Currently, the aviation team in Saudi Arabia is immersed in blade taping, aircraft swapout, aircraft modifications (IPS, MWO's (sic), APU's (sic), ASE changes and various other aircraft programs."

Engine repair became even more important with the advent of the VIIth Corps; the growth of work associated with this meant that there was now a " . . . need to increase (the) TAMP-SA work force to 255-300."⁴⁶⁰

⁴⁵⁸Historian, NDSC, 14 December 1990, notes cited.

⁴⁵⁹MSG, AMSAV-L-EOC, to the AMCOOC-RE, 20 October 1990, subject: (Operation Desert Shield).

⁴⁶⁰MSG, CDR, XVIII Airborne Corps, to the COMUSARCENT, CS, 16 December 1990, subject: Theater Aviation Maintenance Program - Saudi Arabia (TAMP-SA).

The AVSCOM aerial family relied upon four basic engines or their variants, as shown here:

<u>Engines</u>	<u>Theatre Monthly Demand</u>	<u>Theatre Stocks</u>	<u>Abu Dhabi¹ Stocks</u>	<u>Months of Stock in SWA</u>	<u>Months of Stock in CONUS</u>
1. T53L13B(UH-1)	27	25	39(14) ²	2.4	177
2. T53L701A(OV-1)	2	2	6(0)	4	4
3. T53L703(AH-1)	7	11	9(25)	2.9	73
4. T55 ³ L712(CH-47D)	40	9	15(33)	.6	21
5. T63A720(OH-58D)	16	18	35(24)	3.3	133
6. T700-700(UH-60A)	28	2*	4(42)	1.4*	16
7. T700-701(AH-64A)	7	10	4(39)	2	106
8. T700-701C(UH-60L)	10	4	2(23)	.6	18
9. T700-703(OH-58D)	5	5	2(6)	1.4	0

*Theatre inexplicably lost 35 engines. A team in SWA was trying to ascertain why this came to pass.

¹Abu Dhabi received the designation B67; the AVSCOM was B-17.

²Figures in parentheses represent 9BU shipments.

³Mistakenly shown as T53 on the source chart.⁴⁶¹

⁴⁶¹FAX, Mr. Daniel J. Rubery, Logistical Director, AVSCOM, to MAJ McHale, DALO-AV, ODCSLOG, circa 15 February 1991, subject: Aircraft Engine Inventory (9 Feb 91).

One of the four engines, the T-63, became the responsibility of a contractor, Aeromaritime,⁴⁶² to whose shop on Malta the Army had already sent 25 engines by 7 January 1991.⁴⁶³ By 18 January, Aeromaritime had received 33 engines and had completed repairs on three. Overall TAMP-SA Forward Engine Shop production consisted of 147 inductions, 75 completions, 68 Not Repairable This Station (NRTS), and 7 in repair.⁴⁶⁴ Contract labour performed the engine repairs at TAMP-SA Forward.⁴⁶⁵ TAMP-SA Base Engine Shop production lagged far behind; despite assurances from his Directorate for Maintenance that "engine shop production was picking up" there, the AVSCOM commander, noting that the base had, from December 1990 until 15 February 1991, completed only two engines, stated that he was "absolutely dissatisfied."⁴⁶⁶

Assessment

The TAMP-SA Base Engine Shop aside, total engine inductions rose dramatically. A week after the commander's comment about that base, total inductions at the forward shop reached 478 and completions 391. As a representative of the Maintenance Directorate indicated, approximately 25 percent of all of the Army aircraft in the AOR had felt its touch.⁴⁶⁷

⁴⁶²Historian, NDSC, 14 December 1990, notes cited.

⁴⁶³MSG, AMCOO-RE, to the AVSCOM-L-EOC, 7 January 1991, subject: Reference AMC-SWA SITREP #134, 06 January 1991.

⁴⁶⁴Historian, NDSC, 18 January 1991, notes cited.

⁴⁶⁵Historian, NDSC, 2 January 1991.

⁴⁶⁶Historian, NDSC, 15 February 1991.

⁴⁶⁷Historian, NDSC, 22 February 1991.

Maintenance had, moreover, accumulated a large total of completed actions in a number of categories, as a subsequent war-end accounting will relate, and it had, in response to the wants of the VIIth Corps, recently opened at a third site, TAMP-KKMC. On 7 January, it dispatched CPT Powell and a warrant officer to KKMC to prepare for the 13 January 1991 inauguration of that element.⁴⁶⁸ Beginning with a small SIPI base, TAMP-KKMC had an RX capacity for 91 items by 19 February 1991⁴⁶⁹ and had both a CCAD armament team and an AH-1 team on hand by 26 February 1991.⁴⁷⁰ On 20 February 1991, TAMP-KKMC received the first flight of Desert Express Airplane Number 2.⁴⁷¹ Two days later, two C-23B Sherpas added TAMP-KKMC to their route. Together with a proposed augmentation of dedicated C-130s, " AVSCOM-UAE and TAMP-KKMC will be able to issue and receive RX items and expedite theater support," and the TAMP-KKMC was to be able to handle such actions as the cracked OH-58D tail booms, mentioned earlier, as well as all crash-damaged aircraft.⁴⁷²

⁴⁶⁸FAX, LTC Oler, AVSCOM Forward, to the AMSAV-L-EOC, 7 January 1991, subject: TAMP-KKMC. Writer's Note: Hand-written.

⁴⁶⁹Historian, NDSC, 19 February 1991, notes cited.

⁴⁷⁰Memo, AMCOC-RE, for the Deputy Chief of Staff for Readiness, HQ, AMC, subject: SITREP: 26 February 1991.

⁴⁷¹Historian, NDSC, 20 February 1991, notes cited.

⁴⁷²1) MSG, AMCOC-RE, to the AMSAV-L-EOC, 23 February 1991, subject: AMC-SWA SITREP 183, 23 February 1991. 2) Writer's Note: For the latter of which duties the Connecticut National Guard AVCRAD activated on 13 February 1991. See: Ltr, CDR, DESCOM, Chambersburg, Pennsylvania, to the CDR, AMC, 28 February 1991, subject: Activation of Mobilization AVCRAD Control Element (AMACE) to Support Operation Desert Storm Requirements.

Maintenance was, in sum, still expanding, and, as long as well-connected sentiments such as the following appeared

"1. CG, AVSCOM expressed great concern today over the apparent lack of capability to repair the radar altimeter (APU-209) in Southwest Asia. Recent dialog (sic) indicates repairs are limited to contractor/facility expertise and resources within (the) CONUS . . . (a) capability to repair/replace . . . (the APU-209) has costly (sic) potential."⁴⁷³

. . . . it would proceed so.⁴⁷⁴

NOSL

More work meant more people, but not necessarily Army people. Whilst keeping a weather eye for production and repair sources, the directorate discovered that the Naval Ordnance Station, Louisville, (NOSL), could manufacture certain Army items more cheaply and more rapidly than commercial interests, two examples being the UH-60 Black Hawk shock orifice and the T-700 retainer adapter. The NOSL shipped 300 of the former on 29 January 1991 and 88 of the latter two days later.⁴⁷⁵

⁴⁷³MSG, AMSAV-L-EOC, to the AMOOC-RE, 1 February 1991, subject: Radar Altimeter Repair Capability.

⁴⁷⁴Writer's Note: Another indication of the increasing workload at Abu Dhabi was a requirement to base 5 more C-23Bs at nearby Bateen Air Base, together with the 11 civilians and 25 military necessary to fly and maintain them. See: MSG, USCINCENT, to Joint Staff and COMUSARCENT MAIN, 7 February 1991, subject: (Operation Desert Storm).

⁴⁷⁵Historian, NDSC, 28 February 1991, notes cited.

Review

Much as the AVSCOM as a whole, maintenance's main problem was that it had very little control over its customers. For the Repairable Exchange (RX) Program, for example, it might enter into an elaborate agreement regarding the same with the Director for Materiel Management, an agreement complete with standard operating procedures for an RX activity, an RX candidate list, and a confirmed RX list,⁴⁷⁶ but that pact was moot if the field took the easy route and just requisitioned new parts or cannibalized. Indeed, in February 1991, the ARCENT complained that " . . . some systems are not available except from repaired assets . . . "⁴⁷⁷ - as though such assets were unworthy.

Against such niggling complaints, maintenance could post some substantial achievements in major categories, instances of which were:

⁴⁷⁶Memorandum of Agreement (MOU), Director of Maintenance and Director of Materiel Management, HQ, AVSCOM, 14 February 1991, subject: Repairable Exchange Program.

⁴⁷⁷MSG, COMUSARCENT MAIN, to the AMSAV-L-EOC, et alia, 5 February 1991, subject: Logstat Report/No 153.

Helicopter Blade Taping

<u>Model</u>	<u>Number</u>	<u>Ship Sets Done</u>	<u>Percentage of Blades Taped</u>
UH-60	409	392	96
AH-64	255	230	90
CH-47	146	124	85
OH-58C	325	309	95
OH-58D	92	60	65
AH-1	134	127	95
UH-1	<u>358</u>	<u>322</u>	<u>90</u>
Totals	1,719	1,544	90 ⁴⁷⁸

. . . . and

Forward Maintenance Shop

Cumulative Airframe Inductions and Completions

<u>Dates</u>	<u>Inductions</u>	<u>Completions</u>
October 11, 1990	1	1
November 15, 1990	16	3
December 20, 1990	29	23
January 24, 1991	44	37
February 21, 1991	<u>7</u>	<u>15</u>
Totals	478 ¹	391 ¹

¹Totals represent weekly cumulatives. Not all weeks shown.⁴⁷⁹

⁴⁷⁸Chart, Directorate for Maintenance, HQ, AVSCOM, Operation Desert Storm Helicopter Blade Taping Program, 26 January 1991. 2) Chart, Directorate for Maintenance, HQ, AVSCOM, Blade Tape Application World Wide Progress, 26 January 1991. Writer's Note: Totals compiled by the author.

⁴⁷⁹Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

. . . . and, albeit belatedly, healthy results from both Aeromaritime . . .

Aeromaritime T-63

Malta Productions

	<u>Week Ending</u> <u>14 February 1991</u>	<u>Week Ending</u> <u>21 February 1991</u>
Inductions	23	25 ²
Completions	14	14
NRTS ¹	0	0

¹Not Repairable This Station

²Aeromaritime was to begin work on the T709-AD-700 engine after the 22 February 1991 arrival of the first four of said engines.⁴⁸⁰

. . . . and for the TAMP-SA Base

TAMP-SA Base Engine Shop Production

(Less the T-700 Engine)

<u>Week Ending</u> <u>14 February 1991</u>		<u>Week Ending</u> <u>21 February 1991</u>					Totals
		Engine Types					
		T-53 L-13	T-53 L-703	T-55 L-702	T-63	APU	
Inductions	57	28	18	3	1	10	60
Completions	7	2	0	2	0	3	7
NRTS	72	7	7	0	1	7	22 ⁴⁸¹

⁴⁸⁰Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

⁴⁸¹Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

TAMP-SA Base

T-700 Engine Production

Week Ending 14 February 1991		Week Ending 21 February 1991				Totals
		Engine Types				
		T-701	T-700	T-700 T/R	T-700 C/M	
Inductions	38	4	2	28	4	38
Completions	4	0	0	2	3	5
NRTS	24	1	1	21	1	24 ⁴⁸²

TAMP-SA Base

SRA¹ Production
(Less TADS/PNVS)²

	Week Ending 14 February 1991	Week Ending 21 February 1991
Inductions	188	234
Completions	108	124 ³
NRTS	34	42

¹Special Repair Activity

²Target Acquisition Designation System/Pilot Night Vision Sensor; the base repaired 246 of these the first week and 378 the second.

³Chief among the 124 completions were 46 mast-mounted sights.⁴⁸³

⁴⁸²Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

⁴⁸³1) Chart, Directorate for Maintenance, HQ, AVSCOM, TAMP-SA Base TADS/PNVS SRA Production, 21 February 1991. 2) Chart, Directorate for Maintenance, HQ, AVSCOM, TAMP-SA Base SRA Production, 21 February 1991. 3) Writer's Note: Some notion of the acceleration of TAMP-SA work after the start of the war can be found in statistics, which show that only 914 MAOs were complete by 31 January 1991. See: Chart, Directorate for Maintenance, HQ, AVSCOM, 31 January 1991.

In total, TAMP-SA oversaw the removal of 712 line replaceable units (LRUs) from 7 August 1990 through 21 February 1991, with only six removed in error and 237 receiving SRA repair.⁴⁸⁴ The TAMP-SA in the same period completed 1,723 of 3,308 requested Modification Work Orders (MWOs) on the UH-1, AH-1F, AH-64, CH-47D, OH-58A/C, and UH-60 helicopters. The largest number of requests and completions were 795 and 668, respectively, for the UH-1, subjects of said MWOs being an interim infra-red suppressor, night vision goggles (NVGs), and an internal particle separator (IPS).⁴⁸⁵

Supply

Retrograde

As maintenance had its Abu Dhabi engine shop, so too did supply have a vulnerability - retrograde. The cause of both was the same - the recalcitrant⁴⁸⁶ customer

"a) Units are not returning depot level
repairables in a timely manner or (on) a daily
basis (Only on) high visibility items . .
(such as) AIMI . . . (is) return . . . better . .
Many items require that . . . (an) unserviceable
(be) . . . exchanged for a serviceable . . . at

⁴⁸⁴Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

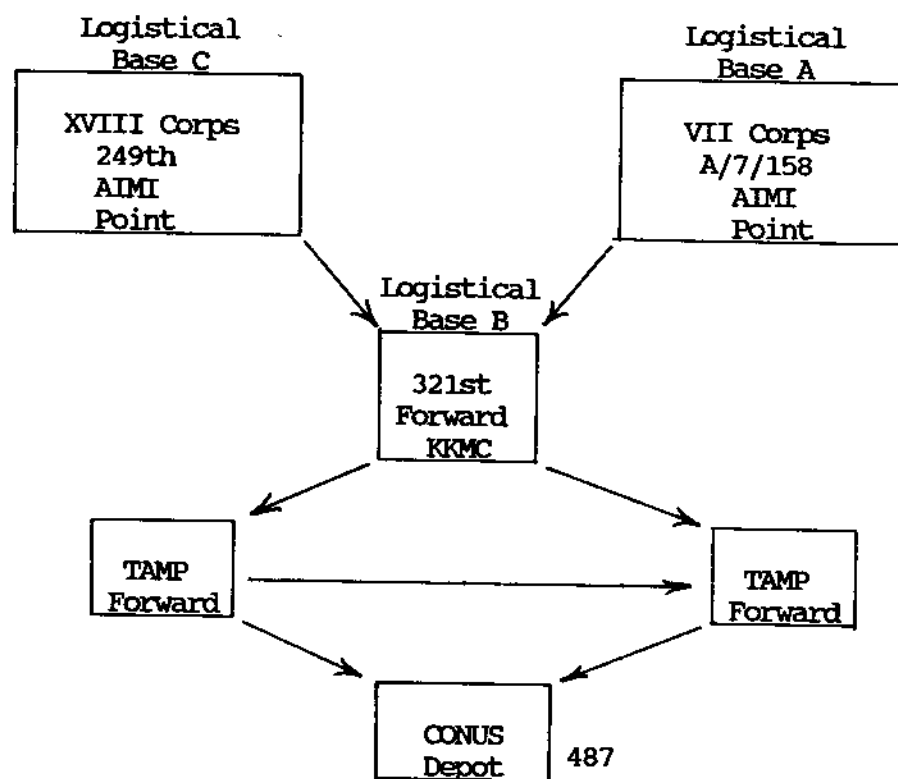
⁴⁸⁵Chart, Directorate for Maintenance, HQ, AVSCOM, 21 February 1991.

⁴⁸⁶Writer's Note: Patently one of the recalcitrants would be a member of the VIIth Corps, in this instance the 1st Cavalry Division, to whom the AVSCOM commander explained the workings of the system. See: Ltr, MG Donald R. Williamson, CDR, AVSCOM, to BG(P) Tilelli, CDR, 1st Cavalry Division, 24 February 1991. subject: Aviation Logistics Support.

(the) time of receipt. There are some items, on the other hand, which allow up to 14 days to return an unserviceable asset to replace the serviceable asset received. If the unserviceable (asset) will not be delivered within the 14 day time limit a letter (strong penalty!) is to be submitted.

b) (Moreover,) Unserviceable assets returned from the field to (the) TAMP are rarely properly packaged or have . . . (that) documentation (necessary for) expediting the retrograde process (These usually appear as an) assortment of unserviceable items in a large box with classification tag but without proper documentation which shows the retrograde process . . . SIPI personnel (have to) brush the sand off, package the asset for shipment and issue proper documentation before shipping to (the) CONUS or (to) Abu Dhabi (sic)."

RX and AIMI unserviceable turn-ins were to follow this chart

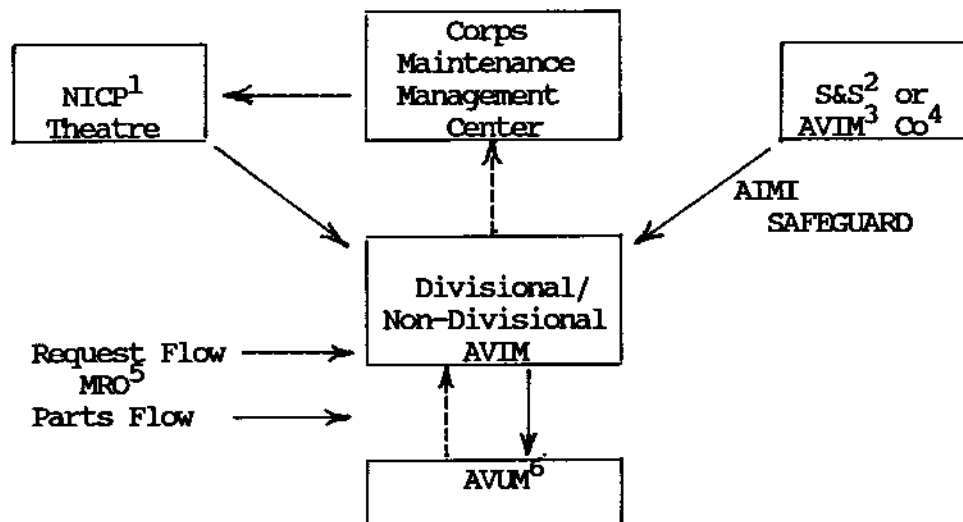


⁴⁸⁷FAX, TAMP-SA Forward, to COL Bruce Gardner, Director of Materiel Management, HQ, AVSCOM, 23 January 1991, subject: Retrograde of Aviation Repairables.

Flow

Routine.

The retrograde malaise inevitably affected routine corps aviation supply, which functioned as follows:



¹National Inventory Control Point

²Services and Supply

³Aviation Intermediate Maintenance

⁴Company

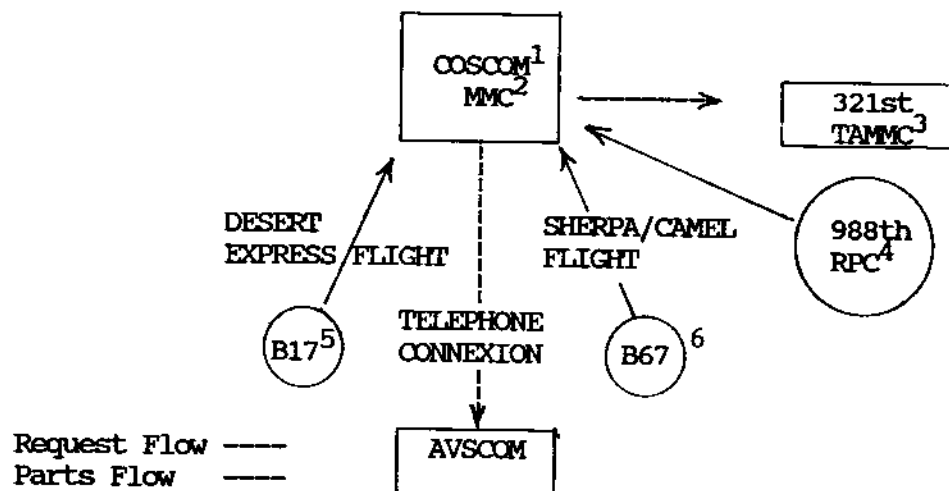
⁵Materiel Release Order

⁶Aviation Unit Maintenance⁴⁸⁸

⁴⁸⁸Chart, Directorate for Maintenance, HQ, AVSCOM, circa 1 March 1991.

Extraordinary

Non-routine supply requests underwent handling in a variety of manners, the most prominent of which were AOG



¹Combat Support Command

²Matériel Management Center

³Theater Army Matériel Management Center

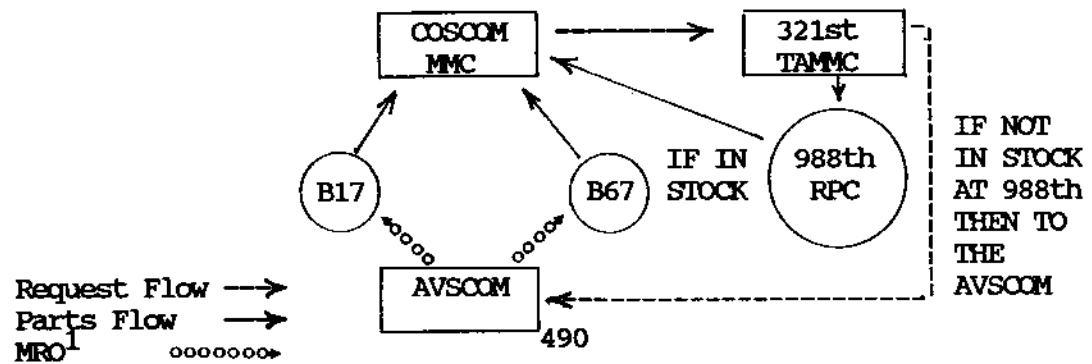
⁴Repair Parts Company

⁵B17 was a code for the AVSCOM

⁶B67 was a code for TAMP-Base.⁴⁸⁹

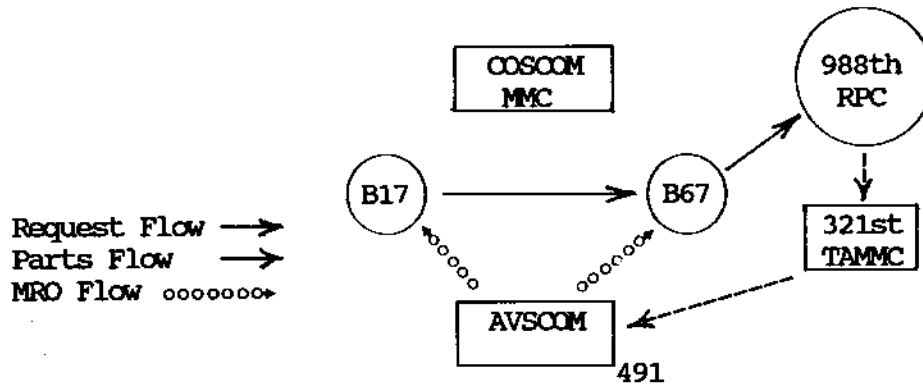
⁴⁸⁹Chart, Directorate for Maintenance, HQ, AVSCOM, circa 1 March 1991.

AIMI



¹Material Release Order

. . . . and battlefield spares replenishment



⁴⁹⁰Chart, Directorate for Maintenance, HQ, AVSCOM, circa 1 March 1991.

⁴⁹¹Chart, Directorate for Maintenance, HQ, AVSCOM, circa 1 March 1991.

The Float in February

A major supply mitigator was, in extremis, a completely-ready-to-go aircraft. Though mis-used by absorption into units, the AVSCOM fashioned float was, with two exceptions, in-place 10 days before the ground war began:

Float Aircraft Availability

as of 13 February 1991

<u>Aircraft Model</u>	<u>10% Float Requirement</u>	<u>ODCSOCS Approved Requirement</u>	<u>In-Country</u>	<u>Shortage</u>
AH-1E	0	0	50	0
AH-1F	14	8	7 ^{1,2}	1
AH-64	25	34	34	0
CH-47D	15	16	16	0
OH-58C	33	17	17	0
OH-58D	9	18	8 ³	10
UH-1H	36	20	20	0
UH-60	39	28	28 ⁴	0
EH-60	<u>3</u>	<u>2</u>	<u>2</u>	<u>0</u>
Totals	173	143	183	10

¹Does not include 3 ready-for-issue (RFI).

²Remedy expected 28 February 1991.

³Five OH-58Ds to depart Fort Hood on 27 February 1991 to meet one-half of this deficit.

⁴Eight directed to meet unit Mobilization Table of Organization and Equipment (MTOE) shortages.⁴⁹²

⁴⁹²Chart, Directorate for Maintenance, HQ, AVSCOM, 13 February 1991.

The 50 AH-1Es shown above obviously never returned to the United States, despite the AH-1F replacement effort, which began as long ago as October of 1990.⁴⁹³

Review and Assessment

Supply, as maintenance, largely met or exceeded the exacting standards set for it by the AVSCOM commander. To his battlefield spares objective of a 90-day supply, the directorate had, by the end of January 1991, over 80,000 items in-country covering over 750 line items of equipment, or 74 percent of his goal.⁴⁹⁴ The directorate did so, moreover, primarily on the basis of its own intelligence and strength; the proposed 84-man ARCENT aviation support structure, which should have had a large logistical element to aid in such an undertaking, eventually took shape, despite DA stricture, as a 10-man, all Forces Command, element.⁴⁹⁵ Consequently, mid-January 1991 found the AVSCOM dealing directly with, and trying to determine the necessities of, 74 aviation elements.⁴⁹⁶ That the AVSCOM successfully did so could be found in a number of measures, a broad one being of responses

⁴⁹³MSG, AMSAV-L-EOC, to the AMOOC-RE, 20 October 1990, subject: (Operation Desert Shield).

⁴⁹⁴Historian, NDSC, 31 January 1991, notes cited.

⁴⁹⁵Ltr, DALO-ZD, ODCSLOG, to the CDR, ARCENT SUPCOM, 27 December 1990, subject: ARCENT Aviation Maintenance Structure.

⁴⁹⁶MSG, COL Gary D. Johnson, TAMP-Forward-Saudi Arabia, to the Directorate of Maintenance, HQ, AVSCOM, 12 January 1991, subject: (79 (sic) Units).

<u>Category</u>	<u>Received</u>	<u>Answered</u>	<u>Percentage Answered</u>
Requisitions	78,677	77,251	98.1
AOGs	2,210	2,194	99.4 ⁴⁹⁷

. . . . and a more specific one being of operations; on 24 February 1991, the first full day of the ground war, 93 percent, or 1,656 of 1,777 Army aircraft in the zone of operations, were mission capable. Of the 121 not so, 14 were "down" due to maintenance and 107 to supply.⁴⁹⁸ This was no small feat; on 16 February 1991, the CINCENT, alarmed at a growth in manpower over the last month, set a limit of 530,000 to the number of troops in his theatre, which already numbered 525,520.⁴⁹⁹ No such limit, however, came into play for Army aviation - on 5 February 1991, there were 1,558 Army aircraft in the AOR; 13 days later, there were 1,721.⁵⁰⁰ Yet despite such a spiral, the total mission capable rate of the fleet was 87 percent, a figure that would have been higher except for the recalcitrant VIIth - four of its 13 models were under 80 percent, while every one of the XVIIIth's were over 80 percent.⁵⁰¹ Moreover, as just mentioned, the mission capable rate swelled.

⁴⁹⁷MSG, AMSAV-L-EOC, to the AMCOOC-RE, 4 March 1991, subject: AVSCOM SITREP 47 - from No. 46, 3 March 1991.

⁴⁹⁸MSG, AMCOOC-RE, to the AMSAV-L-EOC, 25 February 1991, subject: AMC-SWA SITREP 184, 24 February 1991.

⁴⁹⁹MSG, USCINCENT, to the COMUSACENTAF, 16 February 1991, subject: Final End-Strength Ceiling.

⁵⁰⁰1) FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 6 February 1991, subject: Summary Aircraft Status. 2) FAX, DALO-AV, ODCSLOG, to the AMSAV-L-EOC, 19 February 1991, same subject.

⁵⁰¹Memo, AMC-SWA, for the Deputy Chief of Staff for Readiness, HQ, AMC, 20 February 1991, subject: Readiness Rates as of 20 February 1991.

There were no unfathomables in the AVSCOM's supply performance. SWA remained its centre of concern to the war, throughout it, and beyond. As example, as late as 22 February, it dispatched 25 DynCorp personnel to accommodate the XVIIIth Airborne Corps' non-divisional AVIM augmentation.⁵⁰² Thus, while there were longstanding problems, such as an inability to convince units to employ Direct Exchange (DX) properly,⁵⁰³ which the AVSCOM had no power to solve, the AVSCOM could, and did, treat those issues under its sway - GPS, ORF, blade tips, and non-shrink wrapped CH-47s full of sea water, to cite a few examples of many - promptly and thoroughly.⁵⁰⁴ In supply, as in maintenance, the AVSCOM would have the aviation units in the zone of operations at, or near, the Chief of Staff's seemingly impossible goal of 90 percent.

One Hundred Hours: The Mother-of-All-Battles

Action?

Mercifully, the Iraqis, unlike the Nazis and the Japanese in an earlier war, did not come out of their holes to fight after the aerial bombardment ceased. Instead, almost to a man, they hastily surrendered. Thus, from 23 to 27 February 1991, Army aviation had few chances to prove its mettle. It capitalized, however, upon these rarities as the Apache

⁵⁰²Memo, AMC-SWA, for the Deputy Chief of Staff for Readiness, HQ, AMC, 22 February 1991, subject: SITREP #182, 22 February 1991.

⁵⁰³MSG, AMSAV-L-EOC, to the AMOOC-RE, 5 November 1991, subject: (Operation Desert Shield).

⁵⁰⁴Memo, LTC D. Honchul, ARCENT G-4, for the AMSAV-L-EOC, 3 February 1991, subject: Current Issues.

"1. The first shots of the war were fired by eight AH-64s of the 1st Battalion, 101st Aviation Regiment. In executing this attack, (which eliminated the ground radar stations protecting Baghdad,) the aircraft flew from 0100 to 1600 hours and covered 450 nautical miles. During this attack on the Iraqi air defense radar belt, they fired 27 Hellfire missiles all (sic) of which hit their targets. In addition, they fired over 100 2.75 inch rockets and 4000 (sic) rounds of 30mm ammunition with no weapons or sensor system malfunctions.

"2. Nine aircraft of Task Force Normandy flew 1,600 nautical miles in a 3-day period.

- 4/229 (aircraft) killed 48 tanks in one battle

- (an) aircraft from (the) 2/229 flew 45 minutes without oil in (the) main transmission (and landed safely)

- 24 Apaches flew 24 hours without (a) failure

- (an) XVIII Corps aircraft (,) without (a) Fire Control Computer, (a) Heading Altitude Reference, and (an) Auxiliary Power Unit used (its) 30 mm

- (The) only (Apache) loss (was from the)
1/227 - (by a) rocket propelled grenade
(another Apache rescued the two-man) crew (who)
held onto (the stubby) wings."

. . . . and the OH-58D Kiowa Warrior (an armed, or "PRIME CHANCE") aircraft
. . . .

- "21 Jan 91 - two OH-58D (s attacked) Iraqi
"triple A" on (an) oil platform.

- 29 Jan 91 - 3 Hellfire hit 3 platoons -
23 POWs (Prisoners of War)

- 28 Feb 91 - (On) Two reconnaissance missions
(24 Feb) Copperheads (missiles) took out all AA
(anti-aircraft) emplacements and several bunkers."

. . . . and the Black Hawk, which operated at a 90 percent mission capable
(MC) rate during the struggle flying

- "rescue missions, movement of POWs, refuel/
rearm on deep strike missions one battalion
flew 338 missions 120 miles deep during (the) night
preceeding the attack of the 18th Corps (and
during said attack moved) weapons and materiel . . .
(with only) 2 lost"505

505¹) Memo, Mr. Gary L. Smith, PEO, Aviation, for the Office of the Assistant Secretary of the Army(OASA) (Mr. Conver), et alia, 4 March 1991, subject: Apache Performance Data for Southwest Asia. 2) Memo, Mr. Gary L. Smith, PEO, Aviation, for the OASA (Mr. Conver), et alia, 4 March 1991, subject: OH-58D Kiowa Warrior Performance Data for Southwest Asia. 3) Memo, Mr. Gary L. Smith, PEO, Aviation, for the OASA (Mr. Conver), et alia, 4 March 1991, subject: Black Hawk Performance Data for Southwest Asia.

The Huey lost its work-horse status to the UH-60 Black Hawk for this war. As of 1 March 1991, the slightly more than 400-ship UH-60 usurper force had logged over 6,000 flight hours. Initially, in the hostile surroundings, the Black Hawks had operated at a 76 percent mission capable (MC) rate. By the war's onset, however, they had, as noted, attained a 90 percent rate. The AVSCOM had no little part in the above improvements, as the following text relates

"3. Environmental factors were the major detractor(s) to Mission Capable Rates, (sic) however, all of these factors were minimized by implementation of previous initiatives such as polyurethane tape for Main and Tail Rotor Blades, (an) Inlet Particle Separator for the on board Auxiliary Power Unit (APU's (sic)), Protective Rubber Boots for exposed flight controls, covers for exposed surfaces (upon) which the aircraft were parked and pre-formed polyurethane boots for the Main Blade Tip Caps.

"4. Additional operating factors in the desert environment created problems for the air crews in the area of navigation and operation in Nap of the Earth flight envelopes. Again, off the shelf procurements of previously developed systems such as hand held (portable) Global Positioning Systems (GPS) and Aural Voice Altitude Warning Systems has (sic) contributed greatly to the

successful accomplishment of the mission with enhanced crew safety. In addition, the installation of a commercial TACAN navigation system was instrumental in enabling Medical Evacuation crews to locate the hospital ships located off shore in the Gulf and Red Sea. Passenger and crew member safety was also enhanced by the delivery of a previously developed Ballistic Armor Sub-System (BASS) which fits on the floor of the cabin area and cockpit. These systems protected personnel by their ability to stop small arms fire from penetrating in (sic) the floor areas of the aircraft.

"5. The only open issue within the BLACK HAWK FM and AVSCOM Directorate of Engineering is improving the Inertial Particle Separator capabilities of the T700 series of engines. The reason for this is (that) the fine sand (Talcum Powder Form) encountered in the theater of operation was not being ejected from the engines and caused (their) early removal for maintenance and cleaning. This problem is in the final stages of resolution through the development of an engine barrier filter which will significantly enhance the operation of these engines.

"6. Finally, comments received from the commanders and aviators in the units operating the BLACK HAWK have been very favorable."

Attachment: Black Hawk Operations, Desert Shield/Desert Storm

" . 400+ UH-60A/UH-60L Models In Theater

. Mission Capable Rates

CONUS = 76% (Prior to Deployment)

ODS = 90% (At Commencement of Hostilities)

. Missions:

Troop Deployment

Command & Control

Artillery Deployment/Emplacement

Medical Evacuation

Forward Area Resupply

Impactors (sic)	Fix
Main and Tail Rotor Blade Erosion	3M Polyurethane Tape
Auxiliary Power Unit Sand Ingestion	Inlet Particle Separator
Exposed Flight Control Bearings	Rubber Protective Boots
Sand Entering Aircraft Components	Aircraft Protective Covers
Lack of Navigational Aids	Portable GPS & TACAN
Engine Sand Ingestion	Interim Barrier Filter

"1. over 400 BLACK HAWKS (UH-60 and UH-60L Models) were used in support of these operations (sic). As of 1 Mar 91, over 6,000 flight hours were accumulated. The BLACK HAWKS performed their designed missions of Troop Movements, Medical Evacuation, Artillery Movement, Search and Rescue, Forward Area Resupply and Command and Control.

"2. The aircraft in the units which were deployed were in various stages of readiness with an average of approximately a 76% Mission Capable (MC) rate at the time of deployment. After arrival in theater, other factors had some impact on the units (sic) readiness such as damage occurring during shipboard movement and environmental impacts of the desert operating conditions. At the time of hostilities, the fleet average in theater was 90% MC."⁵⁰⁶

Losses

The three helicopters - one Apache, two Blackhawks - mentioned as lost in the just-related performance report were the only three - actually four - Army helicopters lost in that war to hostile action.⁵⁰⁷ Of the three originally reported as lost, one, a 1st Cavalry Division asset, took a rocket-propelled grenade into its right air inlet, said missile subsequently destroying the aircraft's main transmission. After another Apache had rescued the crew, the Army dispatched the downed helicopter, which had fallen into a mine field, with two rockets.⁵⁰⁸ The two Black Hawks were both the victims of small arms fire,⁵⁰⁹ one falling while trying to rescue an F-16 pilot,⁵¹⁰ the

⁵⁰⁶Talking Paper, Mr. Gary L. Smith, PEO Aviation, for the QASA (Mr. Conner) et alia, 4 March 1991, subject: Black Hawk Operations

⁵⁰⁷Historian, NDSC, 1 March 1991.

⁵⁰⁸1) Historian, NDSC, 25 February 1991. 2)MSG, AMCOC-RE, to the AMSAV-L-EOC, 26 February 1991, subject: AMC-SWA SITREP 186, 26 February 1991.

⁵⁰⁹Historian, NDSC, 1 March 1991, notes cited.

⁵¹⁰Historian, NDSC, 27 February 1991.

other, first listed as an AH-64, trying to rescue a B-52 crew.⁵¹¹ The Black Hawk crews were not as fortunate as that of the Apache; one lost all six killed in action, the other had four missing in action.⁵¹² The Black Hawk PM subsequently amended the combat losses to 3, 2 "Ls," and 1 "A."⁵¹³

The VIIth Corps at last had reason to whine; it had taken all of the helicopter battle damage during the shooting:

Units

Helicopter

<u>Models</u>	<u>2ACR¹</u>	<u>1AD²</u>	<u>3AD²</u>	<u>1ID³</u>	<u>1CAV⁴</u>	<u>11CAB⁵</u>	<u>2COSCOM⁶</u>	<u>Totals</u>
AH-64		2			1	1		4
AH-1	1							1
OH-58C				1				1
UH-1							1	<u>1</u>
Grand Total								7

¹Armored Cavalry Regiment

⁴Cavalry

²Armored Division

⁵Combat Assault Battalion

³Infantry Division

⁶Combat Support Command⁵¹⁴

⁵¹¹MSG, AMCOC-RE, to the AMSAV-L-EOC, 28 February 1991, subject: MSGID/STIREP (from USCINCENT). Writer's Note: There is a discrepancy in the sources. Footnote 500 states that both Blackhawks were small arms fire casualties; this source says that the Apache - later counted as a Blackhawk - dropped when two of four SA-25 rockets fired at it exploded 1,000 feet under its fuselage.

⁵¹²MSG, AMCOC-RE, to the AMSAV-L-EOC, 28 February 1991, subject: (Army Aircraft Losses).

⁵¹³Mr. Ronald Gormont, Deputy Project Manager, Black Hawk Project Manager Office, Desert Storm Update, 6 March 1991.

⁵¹⁴Memo, AMC-SWA, for the Deputy Chief of Staff for Readiness, HQ, AMC, 1 March 1991, subject: STIREP #189, 1 March 1991.

Total aircraft losses during the entire period of the Desert Shield/Desert Storm affair were 31, shown below in a comparison with armored vehicles:

<u>Type Vehicle</u>	<u>Class A¹</u>	<u>Class B²</u>	<u>Class C^{3,4}</u>	<u>Total</u>	<u>Fatalities</u>
Aviation	31	5	21	57	6
Armor	20	3	188	211	23

¹The most serious accident class, involving either a totally destroyed aircraft, a fatality, or at least \$250,000 in damage.

²Less than \$150,000 in damages, but more than \$50,000.

³Less than \$50,000 in damages, but more than \$20,000.

⁴Now shown are the other two categories, D - less than \$20,000 but more than \$10,000 in damages, and E, less than \$10,000 in damages. ⁵¹⁵

Aircraft Survivability Equipment (ASE)

Despite facing a considerable array of hostile missiles, no Army aircraft⁵¹⁶ lost its scalp to one of them. The ASE PMO, the reader will recall, had conducted an extensive remedial campaign to protect Army aircraft in the zone of operations. This work was thorough-going and often "dirty" in nature; every lad 'oft had to take a hand. ASE efforts culminated just before the commencement of hostilities, as this account of February 1991 relates . . .

ASE contributions included the pre-deployment of 68 QUIET CAMP SETS, the dispatch of 5 AN/ALQ-162 Continuous Wave (CW) Jammers, and the redistribution of 204 AN/APR-39A(V)1 Radar Warning Receivers (RWRs). "In-country," the 13-man ASE team which operated out of the TAMP in Dhahran, under LTC Peter McGrew, took ASE hardware directly for distribution. The PM, ASE, made sure that every

⁵¹⁵Historian, NDSC, 18 March 1991.

⁵¹⁶Writer's Note: With one possible exception; see footnote 511.

". . . . hardware shipment is personally tracked all the way to its delivery point in-country where it is met and picked up by the ASE PM team for distribution or exchange. A thirty (30) day part supply for an ASE contingency pool is in the process of being established with CECOM at this location. The ASE team will manage this hardware, do direct exchanges, emergency equipment repair, keep the supply system straightened out, answer questions, and assist in everywhere (sic) possible. We are also in the process of moving part of this team forward to KMC. . . . (where a) designated amount of ASE equipment will be placed . . . MAJ Searfoos (, the commander) will be managed under the leadership of LTCOL Pete McGrew."

In addition, the ASE PM installed AN/APR-39(A) Vls RWRs for nine units; substituted AN/ALQ-144A/R systems for basic AN/ALQ-144 IR Jammer systems for nine units; insured that every attack aircraft in eight units received an advanced AN/ALQ-136 QUIET CAMP Radar Jammer, or 230 such jammers in total; and did a myriad of other support tasks. Officers of the team flew aircraft, carried tool boxes, delivered supplies, repaired over 400 installation kits, taught ASE, "kicked tires," and often acted as "jacks-of-all-trades."⁵¹⁷

⁵¹⁷Memo, COL Thomas E. Reinkober, PM ASE, for COL Roy, USARCENT AVN OFCR, 12 February 1991, subject: ASE Project Manager Desert Storm Support.

The ASE PMO's confidence in the success of its endeavours led to its boast
 - "Not one Army helicopter was lost to Iraqi missiles, . . ."518

AVSOM In-Theater Manpower

The 13-man ASE contingent just discussed was scarcely more than two percent of the AVSOM's personnel strength in the zone of operations as of 5 March 1991:

<u>Military/Civilian</u>	<u>LARS</u> ¹	<u>CFSRs</u> ²	<u>Total</u>
74	35	485	594

¹Logistics Assistance Representatives

²Contract Field Services Representatives.⁵¹⁹

The total strength of the theater aviation support program as of 6 March 1991 was 628 with an objective of 983, to be reached in May of 1991:

<u>Element</u>	<u>6 March 1991 Numbers</u>	<u>Projected Numbers</u>
<u>TAMP-SA (Forward)</u>		
Military Civilian	32	44
ARCENT G-4	2	2
Maintenance Augmentation	487	217
Blades	59	54
Modification Work Orders	22	22
CH-47 Engine Air Particle	2	0
Separator		

518J. C. Ferlisi, Editor, "ASE-Fielded, New-Generation IR Missile Jammers Stopped Army Aircraft Loss Cold in Desert Storm, "Gateway Reporter, Volume 14, Number 8, May 1, 1991, pp. 1, 5.

519MSG, AMSAV-L-EOC, to the AMCOO-RE, 5 March 1991.

Engine Service Center	4	2
Corpus Christi Army Depot	9	9
Personnel		
Cobro Corportation	4	0
Beech Aerospace Services	93	81
International		
Sikorsky International	7	5
Products Incorporated		
Life Support		
Logistic Assistance	34	33
Representatives		
Contract Field	38	38
Service Representatives		
New Equipment Training Team	12	12
Aircraft Survivability		
Equipment		
UH-60 Rotor Blade Tip Caps	3	0
Aeromarine	12	5
Miscellaneous	5	4
<u>TAMP-SA (Base)</u>		
Military/Civilian	19	12
Engine Service Center	2	2
SRA ¹ -AH-64	11	11
Shorts Brothers	15	7
C-23B Support	26	6

Johnson Controls Worldwide	35	33
Services		
Corpus Christi Army Depot	6	6
Personnel		
SRA ¹ -Mast Mounted Sight	2	2
SRA ¹ -Integrated Helmet and	2	2
Display Sub-System		
SRA ¹ -Communications and	6	6
Electronics Command		
SRA ¹ -Target Acquisition and	27	25
Designation System		
Totals	983	628

¹Special Repair Activity⁵²⁰

Aircraft Readiness

On 24 February 1991, the first full day of the ground war, seven of the ten helicopter models of the XVIIIth Airborne Corps had a readiness rate over 90 percent, and none were under 80 percent. For the VIIth, three of its ten helicopter models were over 90 percent, and three - all with fewer than 50 of each model - were under 80 percent.⁵²¹ The XVIIIth improved its mission capable rates during the next four days of conflict; the VIIth, almost predictably, did not; its over 90 percent models dropped to one, and its three laggards of under 80 percent got a new companion:

⁵²⁰Chart, Directorate for Maintenance, HQ, AVSCOM, Theater Aviation Support Program as of 06 March 91, 6 March 1991.

⁵²¹MSG, AMCOC-RE, to the AMSAV-L-EOC, 27 February 1991, subject: ARCENT SUPCOM LOGSTREP, 27 Feb 91 - (as of 24 Feb 91).

VIIth Corps Aircraft Readiness

as of 28 February 1991

<u>Aircraft Model</u>	<u>Authorized</u>	<u>On-Hand</u>	<u>PMC</u> ¹	<u>PMC</u> ²	<u>ER</u> ³
AH-64	144	150	113	20	89(95) ⁴
AH-1	58	59	44	4	81(95) ⁴
UH-1	99	107	68	9	80
UH-60	103	103	66	6	72 (sic) (91) ⁴
OH-58C	178	178	148	6	87
OH-58D	44	44	30	4	77
CH-47	16	16	10	5	94(75) ⁴
EH-60	15	15	11	0	73
UH-60V	15	15	13	0	87
UH-1V ⁵	79	79	52	2	81

¹Fully Mission Capable

²Partially Mission Capable

³Equipment Readiness (in Percentages)

⁴Figures in parentheses are 24 February 1991 percentages. If none, there was no change.

⁵As customary, the chart does not display the VIIth's OV1Ds, RV-1Ds, and RC-12s - all fixed wing aircraft. The C-23Bs, further, do not appear on any chart.

XVIIIth Airborne Corps Aircraft Readiness
as of 28 February 1991

<u>Aircraft Model</u>	<u>Authorized</u>	<u>On-Hand</u>	<u>FMC</u>	<u>PMC</u>	<u>ER</u>
AH-64	111	113	95	11	94(88) ¹
AH-1	76	83	70	4	89(92) ¹
UH-1	96	99	90	2	93
UH-60	210	221	178	19	89(93) ¹
UH-60V	37	37	31	6	100(81) ¹
EH-60	12	12	11	0	93
OH-58C	155	146	136	1	94
OH-58D	50	56	47	4	91
CH-47	83	96	82	3	89(92) ¹
UH-1V	57	60	54	0	90(80) ¹

¹Figures in parentheses are 24 February 1991 percentages, if different.⁵²²

⁵²²FAX, AMOOC-RE, to the AMSAV-L-EOC, 1 March 1991, subject, ARCENT SUPCOM LOGSITREP D + 43, 28 Feb 91.

An amalgamated readiness chart appeared on 1 March 1991 for both corps and for those echelons above corps aircraft:

<u>Aircraft Model</u>	<u>On-Hand</u>	<u>MC</u> ¹	<u>MC%</u>	<u>NMCM</u> ²	<u>NMCS</u> ³
AH-64	263	241	92	13	9
AH-1	141	121	86	17	3
UH-1	198	154	78	25	19
UH-60A	313	276	88	20	17
OH-58	6	6	100	0	0
OH-58C	323	295	91	14	14
OH-58D	101	89	88	10	2
CH-47	97	83	86	13	1
EH-60	6	5	83	1	0
UH-60A	24	19	79	4	1
UH-60V	51	46	90	4	1
UH-1V	172	94	84	18	0
OV-1D	7	3	43	3	1
RU-21	0	0	0	0	0
RV-1D	5	4	80	0	1
RC-12	6	6	100	0	0

¹Mission Capable

²Not Mission Capable, Maintenance

³Not Mission Capable, Supply

Echelons Above Corps Aircraft

1 March 1991¹

<u>Aircraft Model</u>	<u>On-Hand</u>	<u>Authorized</u>	<u>FMC</u>	<u>PMC</u>	<u>ER</u>
AH-64	10	10	7	2	90
CH-47	46	46	38	0	84
UH-60A	29	26	18	2	77
UH-60V	12	12	11	0	92
UH-1V	42	44	37	0	84
UH-1H	8	8	6	0	75 ²

¹Presented separately, and differently, from the combined corps list.

²Shown erroneously in the original as 88 percent.

Indicative of the improvement of aircraft supplies was that, in 12 of the 14 model categories affected by readiness rates, NMCM was paramount in 12 and even in another. In aggregate, 124 aircraft were NMCM and only 69 - less than four percent of the fleet - NMCS.⁵²³

A TACOM Comparison

With an admonition that the "war" was not a severe test, Army aviation logistics made commendable marks. A better perception, however, of the AVSCOM's efficacy might lie in a comparison of its work with those of one of its sister MSCs. A brief glance at a line unit's figures reveals, for an instance, that the Tank-Automotive Command's (TACOM's) fighting vehicles did slightly better than the AVSCOM's helicopters:

⁵²³FAX, ARCENT SUPCOM, 6 March 1991, FAX cited.

<u>Vehicle</u>	<u>On-Hand</u>	<u>Number FMC as of 24 Feb 1991</u>	<u>FMC% as of 24 Feb 1991</u>	<u>Number FMC as of 24 Feb 1991</u>	<u>FMC% as of 24 Feb 1991</u>	<u>% Change After 4 Days of Combat</u>
M1A1 Abrams Main						
Battle Tank	353	351	99	317	90	-9%
M2/3 Bradley						
Fighting Vehicle	286	280	98	278	97	-1%
AH-1 Cobra	8	8	100	5	63	-37%
OH-58D	6	6	100	6	100	0%
UH-60	21	18	86	18	86	0% ⁵²⁴

Equipment Assessment

A further look at this TACOM-by-a-nose example does have one disturbing aspect. In slightly over four days, almost 5.7 percent, or 36 of the 637 armored vehicles, fell from their Fully Mission Capable standing; the rotary-winged aircraft had 3 of 35, or nearly 8.6 percent, similarly fall - and both drops in the absence of combat losses. At that pace, the whole aerial fleet would have been Partially Mission Capable, or worse, in 7 weeks.

Nevertheless, in the context of current expectations, the aerial vehicles, in this instance and in sum, did well

⁵²⁴MSG, COL Raines, USARCENT MAIN, G-4 Aviation, Saudi Arabia, to Mr. Daniel J. Rubery, Director of Logistics, HQ, AVSCOM, 7 March 1991, subject: Comparison, Southwest Asia - #195, 7 Mar 91.

"2. In every case our systems performed superbly. Hard work to apply field expedient fixes, such as sacrificial tape to preclude rotary blade erosion and quick filter applications minimized the impact of the terribly harsh environment.

"3. The most important hardware lesson we have learned is that we must look at more permanent filtration and particle separation systems for gas turbine engine and other systems on the aircraft that require air flow. Concerns about reliability on the AH-64 area weapons systems (30mm gun) (sic) and other subsystems on the helicopter were unfounded. The systems performed superbly for long periods with few reported failures."⁵²⁵

One Apache concern, partially resolved, was with the Hellfire Missile. In a test conducted in January 1991 and reported by the ARCENT, the Hellfires had only two hits in five tries:

⁵²⁵Ltr, Mr. Gary L. Smith, PEO Aviation, for the OASA (Mr. Conner), et alia, 4 March 1991, subject: Performance Data for Southwest Asia.

<u>Aircraft Number</u>	<u>Speed</u> ¹	<u>Altitude</u> ²	<u>Distance</u> ²	<u>Result</u>
291	37	110	5,200	Hit
258	36	140	5,700	Miss, Corkscrew, Ground Impact
260	8	120	4,506	Miss, Ground Impact
218	8	150	5,375	Miss, Ground Impact
295	8	270	4,500	Hit

¹Expressed in knots-per-hour.

²Expressed in feet.⁵²⁶

The Accounting

Introduction

On Wednesday, March the 6th, 1991, the 155th anniversary of the fall of the Alamo and a week after the unilateral halt to the war by the President, the daily AVSCOM Desert Storm briefing took the form of a multi-hour review of the accomplishments of the major AVSCOM structural elements in the 7-month diversion, with Mr. Joseph P. Cribbins, Special Assistant for Air to the ODCSLOG, as the guest of honour.⁵²⁷ A sampling of the AVSCOM's offerings were:

⁵²⁶FAX, COL Raines, G-4 Aviation, USARCENT MAIN, Riyadh, Saudi Arabia, to MG Donald R. Williamson, CDR, AVSCOM, 31 January 1991, subject: (Hellfire Test).

⁵²⁷Historian, NDSC, 6 March 1991.

Supply

Requisitions Processed

<u>Requisitions</u>	<u>MROs</u> ¹	<u>INP</u> ²	<u>B/O</u> ³	<u>DS</u> ⁴	<u>Shipped</u>	<u>Satisfied</u>
61,535 ⁵	5,005	408	1,935	613	55,576	93.6%

¹Materiel Release Orders (i.e., to a depot).

²In-Process

³Back-Ordered

⁴Direct Shipped

⁵Versus 81,035 demands. The directorate passed 8,088 to other commands, cancelled 2,745 others, and rejected 7,667.

AOG Requisitions

(All Telephonic to the AVSCOM)

<u>Requisitions</u>	<u>Satisfied</u>	<u>Back-Ordered</u>	<u>Percentage Satisfied</u>
2,455	2,452	3	99.9 ⁵²⁸

Transportation

The two Desert Express aeroplanes were, in the week of 26 February through 4 March 1991, carrying total cargo averaging in weight from about 40,000 pounds to almost 80,000 pounds. The AVSCOM's share of this cargo ranged from less than 1,000 to approximately 12,000 pounds.⁵²⁹

Maintenance

There were 151 AIMI, or Aircraft Intensively Managed Items, at the war's end. Abu Dhabi holdings of AIMI amounted to:

⁵²⁸Briefing, Directorate for Materiel Management, HQ, AVSCOM, 6 March 1991.

⁵²⁹Desert Express Officer, HQ, AVSCOM, Desert Express Briefing, 6 March 1991.

<u>Proponent Command</u>	<u>Number of Lines</u>	<u>Lines on Hand</u>	<u>% of Same</u>
AVSCOM	104	90	87
MICOM	29	11	38
CECOM	<u>18</u>	<u>12</u>	<u>67</u> ¹
	151	113	75

¹Erroneously shown in the original as 75 percent

By far the largest number pertained to the UH-60-37. The Apache was second with 22.

There were, in addition, 122 thousand battlefield spares items in Abu Dhabi. About 79.1 percent of all lines there had spares on-hand.

For the AVSCOM in total, lines in zero balance, that is, no extras on-hand, declined regularly, with the exception of December 1990, from August of 1990, when there were 1,136 such lines, to February of 1991, which showed only 826. Due to early interest in the zone of operations and to the gradualness of the amassment of forces there, Southwest Asia, interestingly, started, and stayed, at about the same stock availability percentage levels:

<u>Element</u>	<u>August 1990</u>	<u>January 1991</u>	<u>February 1991</u>	<u>Last 2-Month Variance</u>
SWA ¹	93.4%	92.4%	91.3%	-.1%
USAREUR ²	77.6%	90.0%	90.2%	+.2%
FORSCOM ³	85.4%	76.0%	71.5%	-4.5%
TRADOC ⁴	76.7%	59.9%	75.1%	+15.2
USARPAC ⁵	81.8%	68.7%	69.4%	
+ .7% ⁶				

¹Southwest Asia

²United States Army Europe

³Forces Command

⁴Training and Doctrine Command

⁵United States Army Pacific

⁶Erroneously shown in the original as -16.3%.

As indicated in the earlier maintenance assessment, various maintenance production programmes, to include airframes, engines, and blade taping, all greatly accelerated after the turn of the year.⁵³⁰

Fielded Aviation Systems

Fielded aviation systems, that was, systems that had completed development and were now under direct HQ, AVSCOM, care, accounted for 994, or 62 percent, of the Army aircraft deployed to the zone of operations, viz.:

⁵³⁰Briefing, Directorate for Maintenance, HQ, AVSCOM, 6 March 1991.

<u>Aircraft Types</u>	<u>Number</u>
Fixed Winged	74
Rotary Winged	
Attack	197
Cargo	0
Observation	347
Utility	<u>376</u>
Total	994

The fixed wing aircraft consisted of one RC-12K; 26 RC-12Ds and RU-21Hs; 34 OV-1s and RV-1s; 5 C-12s; and 8 C-23Bs. Fielded Aviation Systems also supported 12 air traffic control sites and 80 sets of aviation ground support equipments and AVUM and AVIM units. Fielded Aviation Systems contributions included the accelerated design, qualification, and procurement of such items as the Global Positioning System and the M-43 Mask A Kit; hastened the installation of critical Modification Work Orders, such as the Engine Air Particle Separator and Night Vision Goggles; and developed, or introduced, such new items as the clamshell hangars. Finally, Fielded Aviation Systems provided 93 contractor personnel - 81 for the 8 C-12s, and 12 for the C-23B.⁵³¹

Engineering

Engineering's primary focus was abative in character, being the protection of engines, auxiliary power units, rotor blades, windshields, air systems and exposed bearings against the sand. The main items were, as often stated, tape

⁵³¹Briefing, Directorate for Fielded Aviation Systems, HQ, AVSCOM, 6 March 1991.

and paint for the blades, covers for the windshields and bearings, and covers for all wind-sucking motors. The cost benefits of some of these protective measures were enormous:

<u>Item</u>	<u>Replacement Cost of Item</u>	<u>Preventive Measure</u>	<u>Cost of Preventive Measure</u>
UH-60 Rotor Blade	\$70,000	Anti-Erosion Tape	\$1,200
UH-60 Rotor	\$70,000	Paint Kit	\$1,950
UH-60 Tip Caps	\$ 3,050	Tip Cap Boots	\$ 230
AH-64 Tip Caps	\$ 4,345	Tip Cap Boots	\$ 230
Windshield	\$2,500 - \$3,000	Polishing Kit	\$ 220

Other engineering initiatives of significance were the Divisional Aviation Intermediate Maintenance Shop Set, tie down and mooring kits, aircraft recovery kits, and ballistic protection covers.⁵³²

Weapon Systems ASE.

Well-covered elsewhere in the text, the work of the Aircraft Survivability Equipment Project Manager Office (PMO) - the conduct of classes, the repair of over 500 A-kits, and the repair and replacement of thousands of B-kits - had a spectacularly successful outcome - only one - and that debatable - loss to infra-red or radar-directed missiles or guns.⁵³³

⁵³²Briefing, Research, Development and Engineering Center, HQ, AVSCOOM, 6 March 1991.

⁵³³Briefing, ASE PMO, Program Executive Office (PEO) for Aviation, St. Louis, 6 March 1991.

CH-47.

The 157 CH-47s used in the ground war operated over the four days of conflict at an average of 92 percent of mission capability. In one night action, CH-47s flew 338 missions over 120 miles to establish a forward area refueling point for the XVIIIth Airborne Corps. In another, they participated in the dispatch of 2,000 soldiers, with equipment, 50 miles inside of Iraq in three hours.⁵³⁴

UH-60.

The UH-60 Black Hawks, at more than 400 strong, were the largest contingent of any model of Army helicopter in the zone of operations. Seventy-six percent mission capable at deployment, the UH-60 A and L models overcame severe tape, paint, filter and aircraft survivability equipment deficiencies to execute thousands of hours of mission accomplishments at about a 90 percent mission capable rate with only three losses - two "Ls" and an "A."⁵³⁵

AH-64.

As the latest Army aerial fighting vehicle, the AH-64 Apache was most impervious to the desert's denizens. Nevertheless, it, too, was the subject of several special protective measures, to include filters, covers, tape, paint, masks, and laser eye-pieces, all of which cost the PMO \$16,800,000. As with ASE, the Apache's exploits received much attention earlier in this segment; of

⁵³⁴Briefing, CH-47 PMO, PEO for Aviation, St. Louis, 6 March 1991.

⁵³⁵Briefing, Black Hawk PMO, PEO for Aviation, St. Louis, 6 March 1991.

extra note, for durability and reliability, were the two dozen Apaches which, operating in two shifts of a dozen aircraft each, flew 36 continuous hours, at the end of which time all 24 were still flyable, and the overall Apache expenditure of more than 4,000 Hellfire Missiles and 100,000 rounds of 30 millimeter ammunition with no reported problems.⁵³⁶

OH-58D.

The OH-58D, which operated at a nearly 98 percent mission capable rate during the ground war, was the subject of several remedial measures, including 18 critical spares shortages, which the PMO reduced to five; a cracked tailboom grounding message, quickly rectified by tests and spares; and armament of several aircraft, executed via special teams. Additional OH-58D noteworthy actions included the provision of both an extra aviation intermediate maintenance tool set and six float aircraft and the replacement of two crash-damaged aircraft.⁵³⁷

Avionics.

Forwarded in 1990 in recognition of the need for more concern for the ever-increasing electronic nature of the navigation and combat roles of Army airplanes, the PMO Avionics had a host of interests in the zone of operations. Examples of paramount endeavours were radar altimeters, the personnel locator system, the Trimble Trimpack Global Positioning System, and Gun-Aiming Lasers.⁵³⁸

⁵³⁶Briefing, Apache PMO, PEO Aviation, St. Louis, 6 March 1991.

⁵³⁷Briefing, Advanced Helicopter Improvement Program PMO, PEO Aviation, St. Louis, 6 March 1991.

⁵³⁸Briefing, Avionics PMO, PEO Aviation, St. Louis, 6 March 1991.

ALSE.

The Aviation Life Support Equipment PMO dispatched several invaluable items to Southwest Asia. These included laser eye protection devices, the M43 Protective Mask, and a desert survival kit.⁵³⁹

The Aftermath: March and April of 1991

Exordium

Even as the preceding tallies were being presented to Mr. Cribbins, the repatriation of the more than one-half million service members in the zone of operations was underway.⁵⁴⁰ At a possible maximum of 5,000 men per day via aeroplane, this mis-named "Desert Return" meant that, at each succeeding sunset, the inordinate AVSCOM interest in the zone of operations had ever less upon which to centre. It is rather difficult to play upon a beach blown away by a hurricane.

By 19 March 1991, two of the Army's ten major combat elements were already loading their equipment at ports, and two more were preparing to deploy, viz.:

⁵³⁹Briefing, ALSE PMO, PEO Aviation, St. Louis, 6 March 1991.

⁵⁴⁰Writer's Note: "Repatriation" meant, for many, a return to Germany.

XVIIIth Airborne Corps Major Element Stati

<u>Element</u>	<u>Status</u>
24th ID ¹	Loading at Damman
3rd ACR ²	Loading at Jubayl
101st Airbrone Division	Defending in Sector
82nd Airborne Division	Defending in Sector
1st Cavalry Division	Defending in Sector
12th Aviation Brigade	Defending in Sector

¹Infantry Division

²Armored Cavalry Regiment

VIIth Corps Major Element Stati

<u>Element</u>	<u>Status</u>
11th Division	Defending in Sector
2nd ACR ¹	Defending in Sector
1st AD ²	Preparing for Deployment
3rd AD	Preparing for Deployment ⁵⁴¹

¹Armored Cavalry Regiment

²Armored Division

⁵⁴¹Historian, NDSC, 19 March 1991.

As words such as retrograde, redeployment, and return began to float about during the still-daily Desert Storm conferences, "reverse thinking" came forth. Thus the shrink wrap was in route to SWA, not to Savannah, the identification of parts and pallets, and the packaging of materiel for port, was away from, and not toward, the now former zone of operations.⁵⁴² The AVSCOM commander started to worry that the units might arrive at their return ports much as they had in Saudi Arabia - with virtually no supplies, and perhaps for as long as four months.⁵⁴³ Therefore, he wanted a 30-day stock of AIMI to be a-waiting them, with AVSCOM representatives, if necessary, to be in the home ports when the ships berthed,⁵⁴⁴ and a lengthy agenda of actions to be effected immediately after the hawsers alit on the piers. These sequent tasks consisted of:

⁵⁴²Historian, NDSC, 7 March 1991.

⁵⁴³Historian, NDSC, 13 March 1991.

⁵⁴⁴Historian, NDSC, 8 March 1991.

- the provision of IARs and CFSRs at the Ports of Debarkation, the home bases, and in some instances, the demobilization sites;
- the accomplishment of Modification Work Orders as required, at the home base;
- the conduct of Aircraft Condition Evaluations, at the home base;
- the accomplishment of on-condition maintenance inductions, at the home base;
- the furnishment of assistance for this inspection, repair, and sustenance of rotor blades; engines; test, measurement, and diagnostic equipment; and ground support equipment, at the home base;
- the evaluation of repair, supply, publications, and training, at the home base;
- the evaluation of transportability and mission kits, at the home base;
- the assessment of crash and battle damage, at the Point of Debarkation, and the initiation of repairs, at the home base;
- the classification and repair, or disposition, of maintenance-wanting items and equipment, at the home base;
- the provision of "back-up" maintenance, at the home base;
- the extension of assistance for Authorized Stockage List and Prescribed Load List reconstructions;
- the negotiation of the amount of Aviation Intensively Managed Items to be stocked, at the home base;

- and the conferment of aid in the reconstruction of the The Army Maintenance Management System records.⁵⁴⁵

Per practice, the abnormal number of teams again formed - Team Redeployment and Reconstitution,⁵⁴⁶ Team Expedite,⁵⁴⁷ Team Logistics, Team Technical, Team Transport,⁵⁴⁸ Team Retrograde, Team Recovery, Team Return,⁵⁴⁹ and so forth. Description of team tasks were, for instances:

<u>Team</u>	<u>Objectives</u>	<u>Team Leader</u>
Retrograde	Plan and execute the movement of serviceable and unserviceable repairables to the appropriate repair or supply activity.	Directorate for Readiness
Recovery	Recoup float aircraft, mission kits and clamshells.	Directorate for Readiness
Redeployment	Plan and execute procedures to support all aspects of such re-stationing issues as port operations and aerial and sea points of departure form structure.	Directorate for Readiness

⁵⁴⁵Historian, NDSC, 11 March 1991.

⁵⁴⁶Chart, Team Redeployment and Reconstitution (R² later), 20 March 1991.

⁵⁴⁷Historian, NDSC, 1 April 1991.

⁵⁴⁸Historian, NDSC, 15 April 1991, notes cited.

⁵⁴⁹Historian, NDSC, 18 April 1991.

Return	The evaluation, under Deputy CDR, .	Directorate for
	AVSCOM, leadership, and at each	Readiness
	unit's home station, of a unit's	
	condition and status, and the	
	determination of remedial support	
	actions required of the AVSCOM and	
	of the PEO, Aviation. ⁵⁵⁰	

Disengagement

The clamor to bring the boys and the girls home was irresistible, and in short time, the first helicopters were being "shrink wrapped" at Jubayl,⁵⁵¹ the port towards which one of the first two units to re-embark, the 3rd Armored Cavalry Division, headed on 15 March 1991.⁵⁵² The brisk departure pace continued; the 3rd sailed on the 24th of March, and the 24th two days later. On the 28th of March, the 101st Airborne Division and the 12th Aviation Brigade were in tactical assembly areas on the first preparatory step to departure, and the 82nd Airborne Division was in port.⁵⁵³

The AVSCOM seemingly attempted to ignore this exodus. The daily Desert Storm conferences persisted throughout March of 1991,⁵⁵⁴ albeit with many

⁵⁵⁰Chart, Directorate for Readiness, HQ, AVSCOM, 20 March 1991.

⁵⁵¹Conversation, LTC Patrick Oler, Acting Director for Maintenance, HQ, AVSCOM, with Howard K. Butler, 3 June 1991.

⁵⁵²Historian, NDSC, 15 March 1991, notes cited. Writer's Note: The other unit, the 24th Infantry Division (Mechanized), returned to Damman.

⁵⁵³Historian, NDSC, 28 March 1991.

⁵⁵⁴Writer's Note: The meetings went to a Monday and Thursday schedule on Monday, 1 April 1991.

gaps, and the proceedings therein remained rivetted very intensely, at least at first, to the erstwhile zone of operations. Thus, the AVSCOM commander fretted about empty aeroplanes returning with no retrograde aboard,⁵⁵⁵ the deployment of the Aviation Classification and Repair Depot Activity reservists from Connecticut, contractor support for the 15th Military Intelligence Battalion's Mohawks, air traffic control shipments to Southwest Asia, AOG requests for OH-58D tailbooms and T-700 engines, Team Expedite and AIMI,⁵⁵⁶ the cause or causes for a clamshell collapse in Saudi Arabia, the lack of sufficient Test, Measurement, and Diagnostic Equipment, the misuse, misunderstanding and mismanagement of AIMI, the need to integrate Apache tail rotor swashplates into the standard supply system,⁵⁵⁷ and the overhaul of suspect T-63 engines.⁵⁵⁸

Unless one is a member of the House of Lords, it becomes difficult to represent a constituency which no longer exists. So it was with the AVSCOM and Desert Storm. Indeed, the words Desert Recovery started to replace the latter designation as early as 5 March 1991, and, necessarily, redeployment items came to dominate the agenda at the daily to-dos. The AOGs now went to Fort Bragg, not to the desert;⁵⁵⁹ a fight started over which elements would leave the desert with what equipment, such as one about the VIIth Corps's - who else's? - desire to take 103 OH-58Ds to Europe; a debate arose as to whether the tape

⁵⁵⁵Historian, NDSC, 1 March 1991, notes cited.

⁵⁵⁶Historian, NDSC, 4 March 1991.

⁵⁵⁷Historian, NDSC, 7 March 1991.

⁵⁵⁸Historian, NDSC, 8 March 1991.

⁵⁵⁹Historian, NDSC, 5 March 1991.

placed on the blades should be removed, and, if it were, would not maintenance on the exposed blades soar?;⁵⁶⁰ a new anti-erosion spray, ACF-50, surfaced, raising a momentary question of its obviation of shrink-wrap;⁵⁶¹ and an effort commenced to secure a priority airlift status for all 32 drums of ACF-50 from Fort Hood to Saudi Arabia.⁵⁶²

The war was truly done, and signs of its demise were very evident in aviation logistics. The Army grounded the Apache fleet on 14 March 1991;⁵⁶³ the Depot Systems Command closed depot processing for SWA-bound shipments;⁵⁶⁴ Air-Line-of-Communications in the old zone of operations virtually ceased; the monumental backlogs at Tinker and Dover dropped;⁵⁶⁵ hostile fire pay stopped on the 25th of March, 1991;⁵⁶⁶ the Desert Express, though still running,⁵⁶⁷ dropped King Kahlid Military City on 4 April 1991, linking only Dover, Dhahran and Riyadh; B67, or Abu Dhabi, received no materiel release orders on 3 April 1991; four of six repair activities at Abu Dhabi closed;⁵⁶⁸ and key personnel, such as COL Raines, the ARCENT G-4 for Aviation, departed Southwest

⁵⁶⁰Historian, NDSC, 12 March 1991.

⁵⁶¹Historian, NDSC, 18 March 1991.

⁵⁶²Historian, NDSC, 19 March 1991, notes cited.

⁵⁶³Historian, NDSC, 14 March 1991.

⁵⁶⁴Historian, NDSC, 15 March 1991, notes cited. Writer's Note: Some would argue that it had done so much earlier.

⁵⁶⁵Historian, NDSC, 19 March 1991, notes cited.

⁵⁶⁶Historian, NDSC, 25 March 1991.

⁵⁶⁷Historian, NDSC, 1 April 1991, notes cited.

⁵⁶⁸Historian, NDSC, 4 April 1991.

Asia.⁵⁶⁹ One could conclude that, soon, the only Army personnel in Southwest Asia would be 700-odd AVSCOM representatives.

Operation Provide Comfort

That such would not be so was due to Saddam Hussein, who still drew breath. After brutally crushing the Shiites' rebellion to the south, he turned northwards and began to administer the same medicine to the Kurds. After most of the latter folk took to the hills bordering Turkey, the allies mounted a relief expedition to succor the homeless and to establish a buffer zone between them and the Iraqi authorities. Dubbed Operation Provide Comfort and given Joint Chiefs of Staff Project Code 9BU on 15 April 1991, the expedition started modestly:

<u>Type of Aircraft</u>	<u>Number of Aircraft</u>	<u>Pertinent Element</u>
CH-47D	8	E/502
CH-47D	12	D/502
UH-60	15	11 ACR ¹
UH-60	9	9 ID ²
UH-60	<u>6</u>	3 ID ²
Aircraft Totals	50	

¹Armored Cavalry Regiment

²Infantry Division

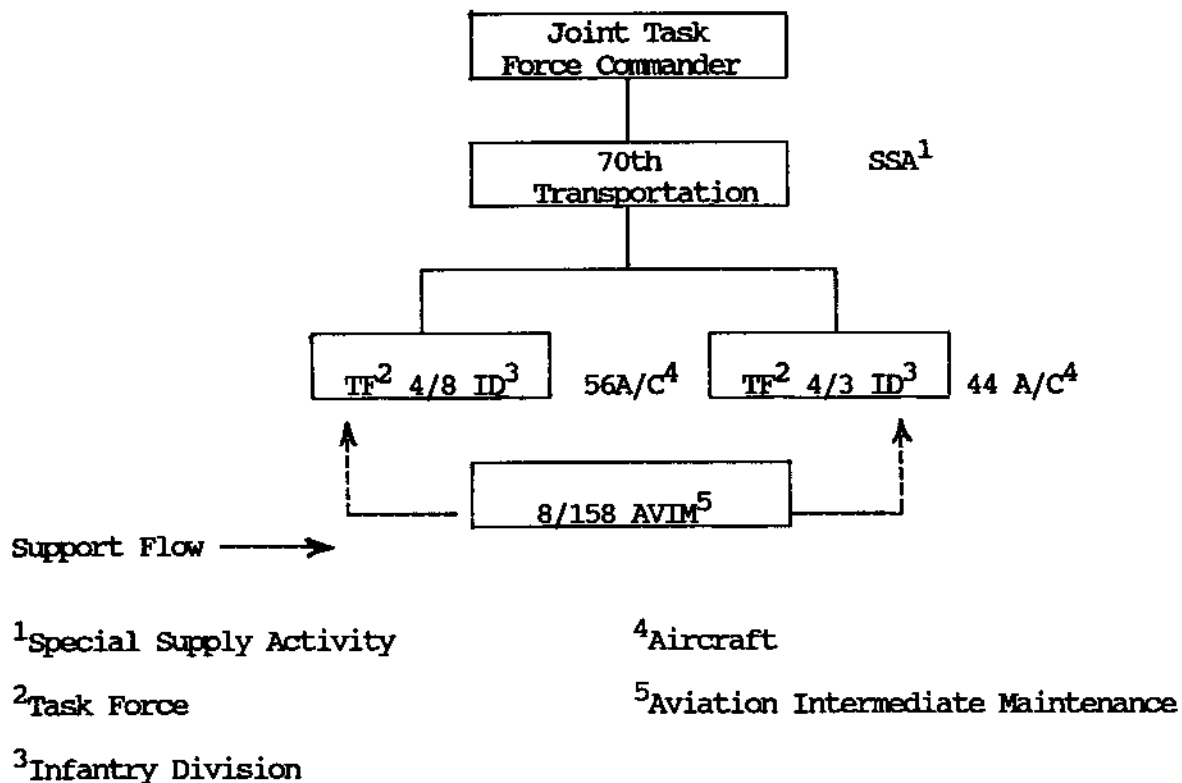
⁵⁶⁹AVSCOM Emergency Operation (sic) Center Activity Report for 25 April 1991, 25 April 1991.

MEDEVAC was not yet firmly arranged, but the support concept had flesh:

<u>Service</u>	<u>Provider</u>
Maintenance	70th Transportation (Agusta)
Supply	200th TAMMC ¹
Air Lift	Daily Logistics "Bird"

¹Theater Army Materiel Management Center.⁵⁷⁰

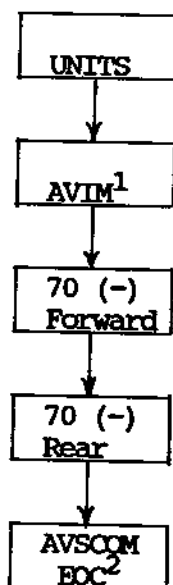
Subsequent Comfort Developments consisted of the outline of a command structure under the leadership of a joint task force commander,⁵⁷¹ and the adumbration of an aviation support organization with twice as many aircraft as originally proposed:



⁵⁷⁰Historian, NDSC, 15 April 1991, notes cited.

⁵⁷¹Historian, NDSC, 18 April 1991.

Aviation requisitions from the two task force units were to proceed thusly:



¹Aviation Intermediate Maintenance

²Emergency Operations Center⁵⁷²

By the 18th of April, 1991, the AVSCOM commander had shifted his parts focus to the Kurdish operation, and he spoke of a Turkish Express. All of the Saudi Arabian issues now reappeared - in addition to parts, this meant equipment shortages, authorized stockage lists, clamshells, float aircraft, forward area refueling points, engineering support, special repair activities, the dispatch of logistics assistance representatives and contract field service representatives, the securement of a Department of Defense Authorized Address Code, the nomination of an Aircraft-on-the-Ground requisition point of contact, the obtainment of a priority for Class IX parts, the transfer of stock from Abu Dhabi, or B67, and onwards ad infinitum. There would also be special problems,

⁵⁷²Historian, NDSC, 22 April 1991.

as in the sand; at the higher altitudes, 8,000 feet and above, the CH-47, for example, could not, according to the Deputy Commander, "pick itself up."

Operation Provide Comfort was, in sum, threading to wax ever larger and more complex. More aircraft, and more models, crept into the conversation; the numbers grew to 176, and AH-1s and UH-1s were first to join the UH-60s and CH-47s,⁵⁷³ to be followed by OH-58Cs and OH-58Ds. Two C-23B Sherpas, moreover, were to ferry supplies out of Turkey.⁵⁷⁴ The refugee airlift, meantime, received a 1B1 priority code on 16 April 1991.⁵⁷⁵

The Rest of the World

Whatever else Project Comfort was, however, it was not, nor did it soon develop into, a war. Except for the unfortunate Kurds, Project Comfort was a small spud. The chances of it sprouting, moreover, daily neared naught as the Army's strength in the region evaporated. Only the 1st and 3rd Armored Divisions of the VIIth Corps were still scheduling aeroplanes aloft as of the 18th of April, 1991;⁵⁷⁶ a week later, of the slightly more than 1,800 Army aircraft which had been in the area at the end of hostilities, 1,136 had undergone shrink-wrapping and 770 had been either loaded aboard ship and departed, or both.⁵⁷⁷

⁵⁷³Historian, NDSC, 18 April 1991, notes cited.

⁵⁷⁴Historian, NDSC, 25 April 1991.

⁵⁷⁵AVSCOM EOC Report, 25 April 1991, report cited.

⁵⁷⁶Historian, NDSC, 18 April 1991.

⁵⁷⁷AVSCOM EOC Report, 25 April 1991, report cited.

Other Issues

As Desert Storm dimmed, the rest of the aviation world nudged ever further into the AVSCOM's attentions. As early as the 7th of March, 1991, the AVSCOM recognized that the Army flying school at Fort Rucker, Alabama, needed remedial logistics attention;⁵⁷⁸ eight days later, the Logistics Center at Fort Eustis, Virginia, called for a return to pre-crisis level standards for worldwide flying hours.⁵⁷⁹ Increasingly, aviation logistics happenings outside of Southwest Asia surfaced at the afternoon conferences, namely Korea,⁵⁸⁰ Honduras, Panama,⁵⁸¹ and Singapore,⁵⁸² and long-standing aviation logistics matters, such as the 1991 meeting of the Annual World-Wide Aviation Logistics Conference, re-assumed their appropriate places.⁵⁸³

Incarceration of the Past

Even before the desert operation slipped away, the AVSCOM commander considered three measures to preserve its experiences for ensuant practitioners and, conceivably, students of the aviation logistics arts. The first of his triad was an old Army standard, "lessons learned."⁵⁸⁴ Of the other two, one,

⁵⁷⁸Historian, NDSC, 7 March 1991, notes cited.

⁵⁷⁹Historian, NDSC, 15 March 1991.

⁵⁸⁰Historian, NDSC, 18 March 1991, notes cited.

⁵⁸¹Historian, NDSC, 22 March 1991.

⁵⁸²Historian, NDSC, 1 April 1991.

⁵⁸³Historian, NDSC, 25 March 1991, notes cited.

⁵⁸⁴Writer's Note: These can be found in one of the appendices to this text.

Team History, never came into being,⁵⁸⁵ the last, Team Survey, took the field on 14 March 1991.⁵⁸⁶

Team Survey prepared a questionnaire for all aviation units that were in Southwest Asia. The queries called for responses about such fundamentals as equipment performance, environmental protection requirements and measures, and the AVSCOM's performance. Within these headings, there were particular questions about subjects ranging from step ladders⁵⁸⁷ to CH-47Ds.⁵⁸⁸ Team Survey made its first report on 18 March 1991.⁵⁸⁹

The Legacy

The Southwest Asian operation featured the largest concentration of Army air power for combat since the Vietnam War. Aviation employment in the later conflict owed much to the former: the large number of helicopters, the use of an especial supply system for Army aviation, the establishment of an aviation support structure in the zone of operations, the almost exclusive reliance upon civilians to keep the aeroplanes aloft, and the curtailment of aviation

⁵⁸⁵Writer's Note: The AVSCOM commander mentioned this unit to the Command Historian on January the 16th, 1991, and subsequently at several of the daily conferences. At one, he handed around an outline, with headings and inked-in assignment areas. Nothing came of it. See: Historian, NDSC, 12 March 1991. The TACOM, interestingly, shortly thereafter decided to form such a team to assist its historical element in the composition of an history of the desert happenings. The team consisted of eight newly-recruited historians and three "Desert Shield" typists, all as aids to the regular staff. More than a year later, four of the historians were still on board, and the TACOM was recruiting a fifth for another project.

⁵⁸⁶Historian, NDSC, 14 March 1991, notes cited.

⁵⁸⁷Briefing, Team Survey, HQ, AVSCOM, 20 March 1991.

⁵⁸⁸Questionnaire, Team Survey, 18 March 1991.

⁵⁸⁹Historian, Team Survey Meeting, 18 March 1991. Writer's Note: The historian, at the behest of the AVSCOM commander, was a member of Team Survey.

operations elsewhere to the betterment of those bound for battle. Vietnam, definitely, had set the pattern for an Army air arm, and, further, it had, through its increasing reliance upon that limb, rendered inherent aviation an irreplaceable cog in the war machine of the ground forces.

The debt acknowledged, the Army faced a different war in a different time. There was no civil war in Saudi Arabia, there was no native Army to raise and train, and, with a few exceptions such as the provision of support to the Chinook helicopters of the British 1st Armoured Division,⁵⁹⁰ Army aviation had only itself about which to ponder.⁵⁹¹ The war was, moreover, its brevity aside, a professional's delight. The enemy had no jungle in which to hide, both the boundaries and the objectives were set and remained so, and, most wonderfully of all, the "battles" were classically set-piece affairs against a foe with inferior fire-power and mobility.

There were, however, disadvantages which a long war would have unearthed. The most prominent of these was the unpreparedness of the Army for just such strife. Under-funding since Vietnam, had inevitably, exacted its real expense, and so the Army came into the play with a largely obsolescent air fleet and little supply stocks. The financial hammer, had, moreover, as the Pillar of Hercules, a twin; the Army would not receive a substantial slug of cash from The Congress to procure and to build. The ebullient '60s were not akin to the grim '90s; the Army would have to fight with what it had on hand.

⁵⁹⁰Historian, NDSC, 29 November 1990, notes cited.

⁵⁹¹Writer's Note: There was no Vietnamese Air Force to equip with, and subsequently to maintain for, 1,207 helicopters. See: Howard K. Butler, Army Aviation Logistics and Vitenam . . ., work cited, pp. 703-767.

Within this constricted sphere, the Aviation Systems command more than matched any aviation logistics requirements levied upon it. The key was initiative, which started with the commander; he tried to anticipate and solve potential problems before they became real ones. In so doing, he acted as a "detail man;" no part was too insignificant for him, and, at many a meeting, he looked at drawings of parts or at the parts themselves, and he concerned himself with all of the intricacies associated with the rectification of any failings in regard to these parts. Such concern for even the minute could not but affect the rest of the command, and briefers who did come thoroughly prepared often came instead to grief - "Wrong answer!", the commander would shout, and fling his copy of the briefing across the table towards the offender.

The commander determined that niceties, particularly bureaucratic ones, would not obstruct the construction of an ample supply and maintenance capacity and capability, respectively, in the zone of operations. His own command was, of course, the most amenable to tinkering; here financial corners could be cut and teams formed which traversed formal structural arrangements. Other commands, particularly higher-level ones, were somewhat less tractable, but, even there, some successes took place, the most prominent of which were the securing of an Aircraft-on-the-Ground priority when the requisition system became an amorphous mass of all top priority requisitions, and Desert Express when the transportation system was no longer able to assure the prompt delivery of top priority cargo.

These achievements - the teams, the AOGs, and the Desert Express - fostered yet another triumph - the accumulation of a war reserve at Abu Dhabi and the

incipient makings of a depot manufacturing capability there. Taken together, this quartet constituted an impressive array for an operation that did not quite last seven months.

Whether these accomplishments would become permanent features of Army aviation logistics remained a question - and a concern - in mid-1991. Other cares were the more than 2,000 aircraft engines that had suffered severe erosion in the desert, the restitution of all Army aircraft to former - "10 - 20" - standards,⁵⁹² the dispatch of such items as clamshells to either Germany or to Fort Hood, and the retention of the war reserve at Abu Dhabi for possible re-stationing elsewhere.⁵⁹³ The resolution, or irresolution, of all of these ponderables did not lie solely with the Aviation Systems Command; much greater military, political, economic, and social forces would undoubtedly do much more to determine what all or any part of the Army would do with its assets, or, in the event, with itself. Since these forces would require some time to determine the Army's destiny, perhaps until the temporarily fabled Twenty-Aught-Aught, then this study is properly at

finis.

⁵⁹²Historian, NDSC, 15 March 1991, notes cited.

⁵⁹³Historian, NDSC, 1 March 1991, notes cited.